11-1520-210-34-1

TM 11-1520-210-34-1

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

DIRECT SUPPORT AND GENERAL SUPPORT

MAINTENANCE MANUAL

ELECTRONIC CONFIGURATION ARMY MODEL UH-1H HELICOPTER

ARMY MODEL UH-1/H HELICOPTER

(WITH STANDARD LIGHTWEIGHT AVIONICS EQUIPMENT)

This copy is a reprint which includes current pages from Changes 1 and 2.

HEADQUARTERS, DEPARTMENT OF THE ARMY

MAY 1973

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WARNING PAGE

HIGH VOLTAGE

When servicing the electronic equipment configurations in helicopters, Army Model UH-1H, be extremely careful of high voltages present in various electronic equipment components. Before performing resistance checks, making any connections, or performing maintenance on the equipment, always turn off or disconnect the power and discharge any high voltage capacitors in the equipment.

RF BURNS

Do not touch or stand near radiating antennas; serious RF burns may result.

WARNING

DANGEROUS CHEMICALS ARE USED IN NICKEL-CADMIUM BATTERIES

The electrolyte used in nickel-cadmium batteries contains potassium hydroxide (KOH), which is a caustic agent. Serious and deep burns of body tissue will result if the electrolyte comes in contact with the eyes or any part of the body. Use rubber gloves, rubber apron, and protective goggles when handling the electrolyte. If accidental contact with the electrolyte is made, use ONLY clean water and immediately (seconds count) flush contaminated areas. Continue flushing with large quantities of clean water for at least 15 minutes. Seek medical attention without delay.

TOXIC FUMES

Cleaning compound is flammable and its fumes toxic. Provide adequate ventilation. Do not use near a flame.

DO NOT TAKE CHANCES!

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CHAPTER 1

INTRODUCTION

1-1. Scope

a. This manual covers direct and general support maintenance of the signal electronic equipment configuration for Army Helicopter Model UH-1H, Serial Numbers 71-20000 and subsequent. This manual includes instructions appropriate to direct support maintenance personnel for performance of periodic inspections and for troubleshooting electronic equipment when the equipment is installed in the helicopter. This manual lists tools, materials, and test equipment required by direct support maintenance personnel to maintain the configuration. Also included in this manual are complete direct and general support maintenance instructions and lists of the tools, materials, and test equipment required for performing bench or shop maintenance of electronic equipment items.

b. Bench maintenance of many of the electronic equipment configuration components is covered in other technical manuals. The pertinent manuals for these electronic equipments are listed in the appendix. When servicing these electronic equipments refer to those technical manuals for detailed troubleshooting, testing, aligning, and repair procedures, and for replacing or repairing maintenance parts.

c. Block diagrams analysis of the entire electronic equipment configuration and the individual facilities that are contained in the electronic equipment configuration are covered in TM 11-1520-210-20-1. Analysis of the electronic configuration interunit circuits are covered in paragraphs 2-2 through 2-12 of this manual. Block diagram and detailed circuit analysis of electronic equipment components that do not have separate technical manuals are covered in chapter 2 of this manual. For electronic equipment covered by separate technical manuals, refer to the pertinent manuals (appendix A) for the block diagram and detailed circuit analysis.

1-1.1. Reporting Errors and Recommending Improvements

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms), direct to Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703.

1-2. Indexes of Publications

a. DA Pam 310-4. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

1-2.1. Maintenance Forms, Records, and Reports

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System.

b. Report of Packing and Handling Deficiencies. Fill out and forward DD Form 6 (Packaging Improvement Report) as prescribed in AR 735-11-2/NAVSUPINST 4440.127E/AFR 400-54/MCO 4430.3E and DSAR 4140.55.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33B/AFR 75-18/MCO P4610.19C and DLAR 4500.15.

1-2.2. Reporting Equipment Improvement Recommendations (EIR)

If your UH-1H Helicopter needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Tell us why a procedure is hard to perform. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703. We'll send you a reply.

1-3. Reference Designations

a. General. Reference designations consist of groups of letters and numbers that identify units, assemblies, subassemblies, and parts. Each reference designation used throughout this manual on applicable illustrations and in the text to identify a particular item is also used in the parts manual (TM 11-1520-210-35P) to identify the same item. Some of the electronic equipment within the overall configuration has refer-

ence designations assigned to items according to the unit numbering system, and some equipment uses the block numbering system. For the reference designation system and the grouping of items within a particular electronic equipment, refer to the applicable technical manual for that equipment. For reference designations assigned to items of the overall electronic equipment configuration and the particular facility with which the items are associated, refer to the table in the following paragraph.

b. Electronic Configuration. Configuration, model, and helicopter serial numbers are configuration I, Model UH-1H, serial 71-20000 and subsequent. The following chart lists the facilities and the applicable electronic equipment of all wiring and installation hardware items and parts associated with the facilities.

Facility	Equipment	Configuration designation
Uhf Command	Radio Set AN/ARC-51BX	I
Vhf am	Radio Set AN/ARC-115	I
Fm liaison No. 1	Radio Set AN/ARC-54	I
	or	
	Radio Set AN/ARC-131	I (NOTE 1)
Voice Security	Computer, Voice Security TSEC/KY-28 and associated installation items	I (NOTE 2 and 3)
Fm liaison No. 2	Radio Set AN/ARC-114	I (NOTE 3)
Hf ssb	Radio Set AN/ARC-102	I (NOTE 3)
Intercommunications	Control C-6533/ARC (four installed) and associated installation items	I (NOTE 2)
Adf	Receiving Set, Radio AN/ARN-83	I
Gyromagnetic Compass	Gyromagnetic Compass Set AN/ASN-43	I
Marker beacon	Receiving Radio R-1041A/ARN	I
Vor	Receiving Set, Radio AN/ARN-82	I
Iff	Transponder Set, AN/APX-72	I
Glideslope/marker beacon	Receiver, Radio R-1963/ARN	I (NOTE 4)
VOR/ILS	Receiving Set, Radio AN/ARN-123(V)	I (NOTE 5)
Radar altimeter	Altimeter Set, Electronic AN/APN-209	I (NOTE 6)

NOTES:

1. Radio Set AN/ARC-131 is functionally and physically interchangeable with Radio Set AN/ARC-54 and may be installed in lieu thereof. All reference to Radio Set AN/ARC 54 apply to Radio Set AN/ARC-131.
2. Refer to TM 11-1520-210-20-1 for a breakdown listing of installation items.
3. Complete provisions only.
4. When MWO 55-1520-210-30-45 has been accomplished. Radio Receiver R-1963/ARN is used with Radio Receiving Set AN/ARN-82 and replaces Radio Receiver R-1041/ARN.
5. MWO has not been published. Radio Receiving Set AN/ARN-123(V) replaces Radio Receiving Set AN/ARN-82 and Radio Receiver R-1041/ARN (or R-1963/ARN).
6. Installed by MWO 55-1520-210-30-48 (MEDEVAC configuration only).

1-4. Use of Term Hertz

The National Bureau of Standards has officially adopted the term Hertz (Hz) to replace cycles per second. The following table provides the equivalents of the unit/quantity terms and the list of approved abbreviations that will be used throughout the manual.

Unit/Quantity	Old term	Old abbreviation	New term	New abbreviation
Frequency	Cycles per second	Cps	Hertz	Hz
10^3 Cycles per second	Kilocycles per second	KC	Kilohertz	KHz
10^6 Cycles per second	Megacycles per second	Mc	Megahertz	MHz
10^9 Cycles per second	Gigacycles per second	Gc	Gigahertz	GHz

CHAPTER 2

EQUIPMENT FUNCTION

Section I. CONFIGURATION INTERUNIT CIRCUIT ANALYSIS

2–1. Introduction To Functioning Discussions

The purpose, operation, and interoperation of the electrical and electronic circuits used in the various configuration of this electronic equipment and in the individual electronic equipment is explained in this chapter and in the technical manuals covering certain electronic equipment used in these configurations (appendix A). Refer to equipment location illustrations in TM 11-1520-210-20-1 for item locations. Familiarity with the electronic equipment configuration and the individual electronic equipment, how they work, and why they work as they do is a valuable tool in troubleshooting the electronic equipment configuration and individual electronic equipment rapidly and effectively.

NOTE

Resistor and capacitor color code diagrams (figure FO-1) are provided to aid maintenance personnel in determining the value, voltage rating, and tolerance of capacitors and resistors.

NOTE

See figure FO-2 for wiring of the audio threshold detector.

NOTE

Throughout Section I of this chapter, as the test is correlated with associated interunit wiring diagrams, refer to paragraph 2-2 for detailed keying information.

2–2. Control, Intercommunication Set C-6533/ARC (Interphone) (figs. FO-2 and FO-3)

a. Power Distribution (Figure FO-3). Two circuit breakers, when depressed, apply +28 vdc to the intercommunication control set (ICS) C-6533/ARC interphone control panels. One circuit breaker, labeled INTERCOM PLT & CREW-R, applies power directly to the ICS control panels for the pilot and right crewmember stations through pin S of P3810 and P3806 respectively. The other circuit breaker, labeled INTERCOM CPLT and CREW-L, applies power directly to the ICS control panels for the copilot and left crewmember stations through pin S of P3809 and P3805 respectively.

b. Microphone Keying Circuit (Figure FO-3). Various arrangements for keying an operators microphone are provided for convenience of the operator as the situation demands, as well as an alternate arrangement in the event of a malfunction with one of the arrangements. An operator's microphone may be keyed by positioning of the cyclic stick trigger switch (pilot and copilot only), depressing the hand switch (right and left crewmembers only), depressing the foot switch, or positioning of the HOT MIKE switch (interphone function only).

NOTE

The HOT MIKE switch located on each ICS control panel provides handfree operation of the interphone function.

(1) Pilot Radio Keying. The pilot's radio keying circuit is from ground (TB26 terminal 5) through J20 pin T to the moving contact of S47, then from S47 terminal 2 (second detent on trigger switch S47) through J20 pin U to P3810 pin B of the pilot's ICS control panel. In addition there is a circuit from ground (TB26 terminal 5) to terminal G on pilot's foot switch, S60, through switch contacts and out (S60 terminal 1) to P3810 pin B of the pilot's ICS control panel.

(2) Pilot ICS Keying. The pilot's ICS keying circuit is from ground (TB26 terminal 5) through J20 pin T to the moving contact of the

pilot's cyclic trigger switch S47, then from the S47 terminal 1 (first detent on trigger switch) through J20 pin S to P3810 pin E of the pilot's ICS control panel.

(3) Copilot Radio Keying. The copilot's radio keying circuit is from ground (TB26 terminal 9) through J22 pin M to the moving contact of the copilot's cyclic trigger switch S48, then from S48 terminal 2 (second detent on trigger switch) through J22 pin L to P3809 pin B of copilot's ICS control panel.

(4) Copilot ICS Keying. The copilot's ICS keying circuit is from ground (TB26 terminal 9) through J22 pin M to the moving contact of the copilot's cyclic trigger switch S48, then from S48 terminal 1 (first detent on trigger switch) through J22 pin N to P3809 pin E of the copilot's ICS control panel.

(5) Right Crewmember Radio and ICS Keying. Keying circuitry for radio or ICS is identical for the crew stations and depends on the position of the selector switch on the ICS panel for either radio or ICS operation. The circuit for hand-switch operation is from ground through J319A pin F to the crewmember's push-to-talk switch on the headset cordage, then from the switch through J319A pin D, and through TB70 terminal section 3 to pin B of the connector on the crewmember's ICS control panel. The circuit for foot-switch operation is from ground to terminal G on the foot switch, through the switch to TB62 pin 3, and through TB70 terminal section 3 to pin B of the connector on the crewmember's ICS control panel.

(6) Left Crewmember Radio and ICS Keying. The keying circuitry for the left crewmember is similiar to the right crewmember's keying circuitry. Refer to preceding step (5).

c. Pilot's Audio (Figure FO-3).

(1) Receive Audio. The audio output from the pilot's ICS control panel at P3810 pin TT is routed to TB23 terminal 2 and then to the pilot's headset/microphone cable. The headset return is routed to TB23 terminal 1 and then to P3810 pin XX and ground.

(2) Transmit Audio. The audio output (high) from the pilot's microphone is routed to TB23 terminal 3 and then to P3810 pin C on the pilot's ICS control panel. The low output from the microphone is routed to TB23 terminal 4 and then to P3810 pin A on the pilot's ICS control panel.

d. Copilot's Audio (Figure FO-3).

(1) Receive Audio. The audio output from the copilot's ICS control panel at P3809 pin TT is routed to TB22 terminal 2 and then to the copilot's headset/microphone cable. The headset return is routed to TB22 terminal 1 and then to P3809 pin XX and ground.

(2) Transmit Audio. The audio output (high) from the copilot's microphone is routed to TB22 terminal 3 and then to P3809 pin C on the copilot's ICS control panel. The low output from the microphone is routed to TB22 terminal 4 and then to P3809 pin A on the copilot's ICS control panel.

e. Right or Left Crewmember's Audio (Figure FO-3).

(1) Receive Audio. The audio output from the right or left crewmember's ICS control panel P3806 or P3805 pin TT is routed to J319A or J319B pin E and then to the crewmember's headset/microphone cable. The headset return is routed to J319A or J319B pin F and then to P3806 or P3805 pin XX and ground.

(2) Transmit Audio. The audio output (high) from the right or left crewmember's microphone is routed to J319A or J319B pin A and then to P3806 or P3805 pin C on the crewmember's ICS control panel. The low output from the microphone is routed to J319A or J319B pin C and then to P3806 or P3805 pin A on the crewmember's ICS control panel.

2–3. Radio Set AN/ARC-51BX (UHF Command)
(figs. FO-3 and FO-4)

a. Power Distribution (Figure FO-4). The UHF ARC-51 circuit breaker, when depressed, applies +28 vdc primary operating power through P1403 pins A and B to contacts and coil of a power relay in the uhf receiver-transmitter RT-752( )/ARC-51BX. (See figure FO-4). Positioning the function selector switch on the uhf control panel (C-6287/ARC-51BX) to T/R+G applies ground from TB26 terminal 6 through

P3801 pin N and the function selector switch of the uhf control panel, out through P3801 pin A to P1403 pin T and the other side of the power relay coil of the uhf receiver-transmitter causing the power relay to energize. The power relay routes primary operating power (+28 vdc) through closed contacts to the uhf receiver-transmitter circuits, activating the facility in the receive mode.

b. Audio Reception. Uhf signals are received by the AT-1108 antenna and applied to P1405 of the uhf receiver-transmitter. (See figure FO-4). The uhf receiver-transmitter extracts the intelligence from the uhf signals and converts the intelligence to audio signals. Audio signals are routed from P1403 pin R of the uhf receiver-transmitter to P3801 pin E of the uhf control panel, out P3801 pin F to J600 pin 24 of the impedance matching network (A16), out J600 pin b through TB20 terminal 3 to pin SS of the associated connector on the ICS control panels, (see figure FO-3), where the audio signals are amplified and routed to the respective headset.

c. Audio Transmission. With the ICS control panel rotary selector switch set to position 2 and the uhf radio set properly keyed at any of the interphone stations, two signals (transmit control and transmit audio) are routed to the RT-742/ARC-51BX uhf receiver-transmitter. The transmit control signal (ground) is routed from pin T of the associated connector on the ICS control panel (see figure FO-3) through the audio threshold detector (Z20), in at P3304 pin J, X, N, or b (pilot, copilot, right or left crewmember respectively) and out P3304 pin h, (see figure FO-4) to P1403 pin P of the uhf receiver-transmitter and energizes the transmitter section. The transmit audio signals are routed from pin R of the associated connector on the ICS control panel (see figure FO-3) to a common tie point, TB20 terminal 2. From TB20 terminal 2 (see figure FO-4), the transmit audio signals are routed through the audio threshold detector (Z20), in at P3303 pin E and out P3303 pin A, to P1403 pin V of the uhf receiver-transmitter for transmission.

2–4. Radio Set AN/ARC-115 (VHF-AM) Facility
(figs. FO-3 and FO-5)

a. Power Distribution (Figure FO-5). Primary operating power (+28 vdc) is applied to the AN/ARC-115 vhf-am receiver-transmitter through the VHF XCVR COMM circuit breaker, when depressed, to P3201 pin D of the vhf-am receiver-transmitter.

b. Audio Reception. Received audio signals from the radio set are routed from P3201 pin d through the impedance matching network (A16), in at J600 pin e and out J600 pin 27, to TB20 terminal 10. From TB20 terminal 10, the signal is routed to pin PP of the associated connector on each ICS control panel where the signals are amplified and routed to the respective headsets. (See figure FO-3.)

c. Audio Transmission. With the ICS control panel rotary selector switch set to position 3 and the vhf-am radio set properly keyed at any of the interphone stations, two signals (transmit control and transmit audio) are routed to the AN/ARC-115 vhf-am receiver-transmitter. The transmit control signal (ground) is routed from pin N of the associated connector on the ICS control panel (see figure FO-3) through the audio threshold detector (Z20), in at P3304 pin R, Y, M, or c (pilot, copilot, right or left crewmember respectively) and out P3304 pin G (see figure FO-5), to P3201 pin h of the vhf-am receiver-transmitter and energizes the transmitter section. The transmit audio signals are routed from pin L of the associated connector on the ICS control panel (see figure FO-3) to a common tie point, TB20 terminal 5. From TB20 terminal 5 (see figure FO-5), the transmit audio signals are routed through the audio threshold detector (Z20), in at P3303 pin C and out P3303 pin G, to P3201 pin K of the vhf-am receiver-transmitter for transmission.

2–5. Radio Set AN/ARC-54 or ARC-131 (No. 1 FM Liaison) and TSEC/KY-28 (Secure Voice) Facility
(figs. FO-3 and FO-6)

a. Power Distribution.

1. FM Radio Set (Figure FO-6). Primary operating power (+28 vdc) is applied to TB19 terminal 5 through the FM ARC-54 circuit breaker when depressed. At TB19 terminal 5, the power is split into three paths and routed to P2107 pins C, D, and E, respectively, on the fm control panel. When the mode selector switch on the fm control panel is set to PTT (on) (TR for AN/ARC-131), +28 vdc is routed out of P2107

pins F, e, and f through rfi filter (FL1) to P2106 pins 36, 18, and 34, respectively on the fm receiver-transmitter.

2. Secure Voice Set (Figure FO-6). Primary operating power (+28 vdc) is applied to terminal 3 of the remote cipher lights (DS82 and DS83) and simultaneously to P423 pin A of the C-8157/ARC secure voice control indicator through the KY-28 VOICE SECURITY circuit breaker when depressed. When the CIPHONY switch on the secure voice control indicator is set to POWER ON, +28 vdc is routed out of P423 pin B to P422 pin J of the TSEC/KY-28 secure-voice encoder-decoder.

b. Audio Reception (Plain Mode). Audio signals from the fm receiver-transmitter are routed from P2106 pin 13 to P422 pin G, then through P421 pin F and into P2107 pin JJ of the fm control panel. From the fm control panel, the audio signals are routed out of P2107 pin N into P3304 pin A of the audio threshold detector (Z20) (see figure FO-2 for internal wiring of audio threshold detector). From the audio threshold detector (Z20), the audio signals are routed out four separate pins of P3304 to each ICS control panel connector. Pilot's audio is from P3304 pin f into P3810 pin KK. (See figure FO-3.) Copilot's audio is from P3304 pin T into P3809 pin KK. Right crewmember's audio is from P3304 pin Y into P3806 pin KK. Left crewmember's audio is from P3304 pin U into P3805 pin KK.

c. Audio Transmission (Plain Mode). With the ICS control panel rotary selector switch set to position 1 and the No. 1 fm radio set properly keyed at any of the interphone stations, two signals (transmit control and transmit audio) are routed to the RT-348( )/ARC-54 fm receiver-transmitter. The transmit control signal (ground) is routed from pin X of the associated connector on the ICS control panels (see figure FO-3) to a common tie point, TB19 terminal 4. From TB19 terminal 4 (see figure FO-6), the transmit control signal is routed through the C-3835/ARC-54 fm control panel, in at P2107 pin q and out P2107 pin v, to P2106 pins 41 and 42 of the fm receiver-transmitter and energizes the transmitter section. The transmit audio signals are routed from pin V of the associated connector on the ICS control panels (see figure FO-3) to a common tie point, TB20 terminal 4. From TB20 terminal 4, the transmit audio signals are routed through P421 pin A (see figure FO-f) to P2107 pin y of the fm control panel, then out of the fm control panel at P2107 pin x, through P422 pin V to P2106 pin 6 of the fm receiver-transmitter for transmission.

d. Retransmit Audio. (Refer to No. 2 fm facility, paragraph 2-6.)

e. Audio Reception (Secure Voice Mode). The No. 1 fm facility secure voice mode is activated by setting the PLAIN-CIPHER toggle switch, located on the front panel of the secure voice control indicator (C-8157/ARC), to the CIPHER position. Secure voice audio signals from the fm receiver-transmitter are routed from P2106 pin 15 to P422 pin D of the secure-voice encoder-decoder for decoding, then out P421 pin F. From P421 pin F, the audio path is the same as presented in preceding step (b).

f. Audio Transmission (Secure Voice Mode). Selection, keying, and routing of the transmit control signal from the ICS control panels are the same as for plain mode audio transmission previously explained in step c except that the transmit control signal has an additional function. The transmit control signal in addition to energizing the transmitter section of the fm receiver-transmitter is routed out of the fm receiver-transmitter at P2106 pin 44 to P422 pin M of the secure-voice encoder-decoder to initiate coding of the audio signal. The transmit audio signal routing is the same as described in previous step c up to the common tie point, TB20 terminal 4. From TB20 terminal 4, the transmit audio signals are routed to P421 pin A of the secure-voice encoder-decoder (see figure FO-6) where the audio signals are coded and then routed out P422 pin P to P2106 pin 7 of the fm receiver-transmitter for transmission.

g. Homing. When the mode selector switch on the No. 1 fm control panel is positioned to HOME, +28 vdc is routed out of P2107 pin DD to terminal X1 of two signal transfer relays (K53 and K54) and to P2106 pin 16 of the fm receiver-transmitter through diode CR33 connected across TB71 terminals 1 and 2. (See figure FO-6.) Relays K53 and K54 energize and switch inputs to the ID-1347/ARN-82 course indicator from the vhf navigation (omni) set (refer to paragraph 2-11) to the No. 1 fm liaison set. The +28 vdc applied to P2106 pin 16 energizes a relay (K202) in the fm receiver-transmitter to

route signals received by the AS-1922( )/ARC fm homing antenna to the rf amplifier module. These signals are converted into drive signals to operate the verticle and horizontal pointers and flags on the ID-998/ARC-82 course indicator.

2–6. Radio Set AN/ARC-114 (No. 2 FM Liaison) Facility
(figs. FO-3 and FO-7)

a. Power Distribution (Figure FO-7). Primary operating power (+28 vdc) is applied directly to P3302 pin D of the No. 2 fm receiver-transmitter through the FM 2 ARC-114 circuit breaker when depressed. Power ground is applied directly to P3302 pin E from TB26 terminal 4. Positioning the mode selector switch on the No. 2 fm receiver-transmitter to any position other than OFF activates the AN/ARC-114 radio set for operation.

b. Audio Reception. Audio signals received from the No. 2 fm receiver-transmitter are routed from P3302 pin d (see figure FO-7) through the impedance matching network (A16), in at J600 pin 26 and out J600 pin d, to TB20 terminal 12. From TB20 terminal 12 (see figure FO-3), the received audio signals are routed to pin EE of the associated connector on each of the ICS control panels where the audio signals are amplified and routed to the respective headsets.

c. Audio Reception (Re-Transmit). The re-transmit mode of operation requires that the mode selector switches on the No. 1 fm liaison set (AN/ARC-54 or AN/ARC-131) and the No. 2 fm liaison set (AN/ARC-114) both be positioned to RETRAN. Vhf signals received by the No. 2 fm receiver-transmitter are converted into two signals (re-transmit control and re-transmit audio). The re-transmit control signal (see figure FO-7) is routed from P3302 pin H of the No. 2 fm receiver-transmitter to P2107 pin u of the No. 1 fm control panel where the signal is routed as one of two signals, either re-transmit control (carrier) or re-transmit control (tone) as selected by the SQUELCH switch on the No. 1 fm control panel. One of these two signals is then routed from the No. 1 fm control panel (see figure FO-6) at P2107 pin Y (carrier) or pin Z (tone) to P2106 pin 10 or 11, respectively, of the No. 1 fm receiver-transmitter. Either re-transmit control (carrier or tone) signal activates the transmitter section of the No. 1 fm receiver-transmitter for transmission. The re-transmit audio signal is routed from P3302 pin X of the No. 2 fm receiver-transmitter (see figure FO-7) through the No. 1 fm control panel, in at P2107 pin c and out P2107 pin x (see figure FO-6). At this point, the signal path for the re-transmit audio is the same as the normal transmit audio signals described in audio transmission of the AN/ARC-54 facility. Refer to paragraph 2-5, c and f.

d. Audio Transmission. With the ICS control panel rotary selector switch set to position 5 and the No. 2 fm radio set properly keyed at any of the interphone stations, two signals (transmit control and transmit audio) are routed to the No. 2 fm receiver-transmitter. The transmit control signal (ground) is routed from pin BB of the associated connector on the ICS control panels (see figure FO-3) through the audio threshold detector (Z20), in at P3304 pin W, a, K, or e (pilot, copilot, right or left crewmember respectively) and out P3304 pin h, to P3302 pin H (see figure FO-7) of the No. 2 fm receiver-transmitter and energizes the transmitter section of the No. 2 fm receiver-transmitter for transmission. The transmit audio signals are routed from pin p of the associated connector on the ICS control panels (see figure FO-3) to a common tie point, TB20 terminal 7. From TB20 terminal 7, the transmit audio signals are routed through the audio threshold detector (Z20), in at P3303 pin L and out P3303 pin R (see figure FO-7), to P3302 pin K of the No. 2 fm receiver-transmitter for transmission.

e. Audio Transmission (Re-Transmit). The re-transmit mode of operation requires that the mode selector switches on the No. 1 fm liaison set (AN/ARC-54 or AN/ARC-131) and the No. 2 fm liaison set (AN/ARC-114) both be positioned to RETRAN. Vhf signals received by the No. 1 fm receiver-transmitter are converted into two signals, re-transmit control (carrier) or re-transmit control (tone) and re-transmit audio. The re-transmit control (carrier) or (tone) signal, dependent upon the transmission mode of the received vhf signal, is routed from P2106 pin 10 or pin 11, respectively, of the No. 1 fm receiver-transmitter (see figure FO-6) through the No. 1 fm control panel, in a P2107 pin Y (carrier) or pin Z (tone) and out P2107 pin HH (see figure FO-7), to P3302 pin H of the No. 2 fm receiver-transmitter and energizes the transmitter section of the No. 2 fm receiver-transmitter for transmission. The re-transmit audio is routed

from the No. 1 fm receiver-transmitter to P2107 pin JJ of the No. 1 fm control panel in the same manner as previously described in audio reception for the AN/ARC-54 facility. Refer to paragraph 2-5, b and e. The mode selector switch of the No. 1 fm control panel then routes the re-transmit audio out P2107 pin A to P3302 pin Y of the No. 2 fm receiver-transmitter for transmission.

2–7. Radio Set AN/ARC-102 (HF-SSB) Facility (figs. FO-3 and FO-8)

a. Power Distribution (Figure FO-8). Depressing the HF ARC-102 circuit breaker applies +28 vdc to TB44 terminals 1, 2, 3, and 4 and also applies +28 vdc to the HF ANT COUPLER and ARC-102 HF STATIC INVTR circuit breakers. From TB44 terminals 1, 2, 3, and 4, the +28 vdc is applied to P1806 pins 1, 2, 3, 13, 14, 15, and 17 of the RT-698( )/ARC-102 hf receiver-transmitter. Depressing the HF ANT COUPLER applies +28 vdc through TB44 terminal 6 to P1806 pins 4 and 16 of the hf receiver-transmitter. Depressing the ARC-102 HF STATIC INVTR applies +28 vdc through TB44 terminal 5 to P1809 pins 2 and 3 of the PP-3702( )/ ARC-102 power supply.

b. Audio Reception. The hf input from the longwire antenna is routed through the CU-1658( )/A impedance matching network, in at the antenna terminal and out P1803, through J1802 and P1802 to the hf receiver-transmitter through P1801. (See figure FO-8.) Audio signals developed from the hf input are routed out P1806 pin 58 of the hf receiver-transmitter, through the impedance matching network (A16) (in at J600 pin 19, through R602, and out J600 pin W), to TB20 terminal 11. From TB20 terminal 11, (see figure FO-3), the audio signals are routed to pin MM of the associated connector of each ICS control panel where the signals are amplified and routed to the respective headsets.

c. Audio Transmission. With the ICS control panel rotary selector switch set to position 4 and the hf-ssb radio set properly keyed at any of the interphone stations, two signals (transmit control and transmit audio) are routed to the hf receiver-transmitter. The transmit control signal (ground) is routed from pin F of the associated connector on the ICS control panels (see figure FO-3) through the audio threshold detector (A16), in at P3304 pin S, Z, L, or d (pilot, copilot, right or left crewmember respectively) and out P3304 pin G, to TB19 terminal 8. From TB19 terminal 8, the transmit control signal is routed through the C-3940/ARC-94 hf control panel (see figure FO-8), in at P1808 pins m and k and out P1808 pins q and p respectively. The transmit control signal from P1808 pin p is routed directly to P1806 pin 31 of the hf receiver-transmitter. The transmit control signal from P1808 pin q is routed through TB44 terminal 10 to P1808 pin 55 of the hf receiver-transmitter and through P1805 pin 5 to P1804 pin K of the CU-1658( )/A impedance matching network. The transmit control signal then continues out of the CU-1658( )/A impedance matching network at P1804 pin S, through P1805 pin F, to P1806 pin 5 and forms an interlock circuit which in conjunction with the transmit control signals routed to P1806 pins 31 and 58 activate the transmitter section of the hf receiver-transmitter. The transmit audio signals are routed from pin F of the associated connector on the ICS control panels (see figure FO-3) to a common tie point, TB20 terminal 6. From TB20 terminal 6, the transmit audio signals are routed through the audio threshold detector (Z20), in at P3303 pin N and out P3303 pin J, through the impedance matching network (A16) (see figure FO-8), in at J600 pin U and out J600 pin T, to P1806 pin 37 of the hf receiver-transmitter for transmission.

2–8. Radio Receiver AN/ARN-83 (ADF) Direction Finder Facility (figs. FO-3 and FO-9)

a. Power Distribution (Figure FO-9). Depressing the LF NAV ADF circuit breaker applies +28 vdc for the AN/ARN-83 direction finder facility to P302 pin K of the C-6899( )/ARN-83 adf control panel. Positioning the function switch on the adf control panel to ADF, ANT, or LOOP routes the +28 vdc through the adf control panel and out P302 pin L to P407 pin 26 of the R1391( )/ARN-83 adf receiver thus activating the receiver circuits. Depressing the COURSE IND circuit breaker (CB98) applies 26 volts, 400 Hz for tuning and synchro excitation simultaneously to P302 pin J of the adf control panel, P407 pins 8 and 18 of the adf receiver, and P403 pin 27 of the ID-998/ASN radio magnetic compass indicator. Within the ID-998/ASN radio magnetic indicator (see figure FO-13), 26 vac is routed through the VOR/ADF switch (positioned to ADF) to the No. 1 pointer synchro and simultaneously out P403 pin 53 (see figure FO-9) to the No. 1 pointer synchro of the ID-250A/ARN course indicator at P409 pin M.

b. Signal Distribution. When the function switch on the adf control panel is positioned to ADF, the direction finder facility receives

directional radio signals from the loop antenna (AS-1863( )/ARN-83) and nondirectional radio signals from the sense antenna (205-075-325) to P404 and P406, respectively, of the adf receiver. The adf receiver processes these two rf signals, determines the radial bearing of the station tuned in, and routes the bearing data out of P407 pins 19 and 20 to the pilot's ID-998/ASN radio magnetic indicator P403 pins 23 and 22 respectively (see figure FO-9). The bearing data is then routed through the VOR/ADF switch (positioned to ADF) in the ID-998/ASN radio magnetic indicator (see figure FO-13) to the No. 1 pointer of the indicator and simultaneously out P403 pins 32 and 31 to the No. 1 pointer of the copilot's ID-250A/ARN course indicator at P409 pins P and N respectively (see figure FO-9). Bearing data is displayed in degrees by the indicators as a relationship of the No. 1 pointer and the compass card.

c. Audio Signal Distribution. The audio signal from the adf receiver is routed from P407 pin 23 (see figure FO-9) to pin P302 T of the adf control panel. The signal is routed through the gain control of the adf control panel and out P302 pin W to J600 pin 18 of the impedance matching network (A16), through R613 and out J600 pin V. From the impedance matching network (A16), the signal is fed to TB19 terminal 3 (see figure FO-3) at which point it is distributed to pin WW of the associated connectors on each ICS control panel where the signals are amplified and routed to the respective headsets.

2–9. Gyromagnetic Compass Set, AN/ASN-43 (fig. FO-10)

a. Power Distribution. Operating power (115 volts, 400 Hz and 26 volts, 400 Hz) for the gyromagnetic compass facility is applied by depressing the GYRO CMPS and COURSE IND circuit breakers on the ac circuit breaker panel. Depressing the GYRO CMPS circuit breaker (CB88) applies 115 vac to TB10 terminals 1 and 2 and to P415 pin 7 of the AM-3209( )/ASN electronic control amplifier. From TB10 terminals 1 and 2, the 115 vac is applied to P411 pins L, R, V and C of the CN-998( )/ASN directional gyro. Depressing the COURSE IND circuit breaker (CB98) applies 26 vac for compass card synchro excitation through TB1 terminal 12 to P409 pin V of the ID-250A/ARN course indicator and also to P403 pins 16 and 21 of the ID-998/ASN radio magnetic indicator.

NOTE

The copilot's course indicator (ID-250A/ARN) is a repeater type synchro, driven from the pilot's radio magnetic indicator (ID-998/ASN).

b. Dg Stabilized Reference Signal. The dg stabilized reference signal is a three-wire signal from the directional gyro to the ID-998/ASN radio magnetic indicator. The first wire is routed from P411 pin H on the directional gyro to P403 pin 1 on the radio magnetic indicator. The second wire is routed from P411 pin G to P403 pin 2. The third wire is routed from P411 pin J to P403 pin 3.

c. Compass Transmitter Output Signal. The T-611( )/ASN compass transmitter output signal, which is differential synchro input of the ID-998/ASN radio magnetic indicator, is a three-wire signal. The first wire is routed from terminal B on the compass transmitter through J410 pin B to P403 pin 42 on the radio magnetic indicator. The second wire is routed from terminal C on the compass transmitter through J410 pin C to P403 pin 43. The third wire is routed from terminal A on the compass transmitter through J410 pin A to P403 pin 44.

d. Slaving Synchro Output Signal. The slaving synchro output signal is routed from P403 pins 45 and 46 of the ID-998/ASN radio magnetic indicator to P411 pins D and B, respectively, on the directional gyro.

e. COMPASS Slaving Switch. A dc voltage is routed from P411 pin P on the directional gyro through P506 pin V to terminal 2 on the COMPASS slaving switch. Terminal 3 of the switch is routed to P411 pin E on the directional gyro.

f. Annunciator Signal. The annunciator signal is routed from P411 pins a and b of the directional gyro to P403 pins 51 and 48, respectively, of the radio magnetic indicator.

g. Compass Power Failure Flag Signal. The dc voltage at P415 pin 10 of the electronic control amplifier is routed to P403 pin 54 of the ID-998/ASN radio magnetic indicator. Pin 55 of P403 is routed to ground to provide a return circuit for the signal.

2–10. Marker Beacon Facility, R-1041A/ARN (figs. 2-1 and FO-3)

a. Power Distribution (Figure 2-1). Positive 28 vdc for the marker beacon facility is applied by depressing the MARKER BEACON R-1041A circuit breaker (CB20). Power from the circuit breaker is applied through J506 pin M to terminal 1 of the MARKER BEACON VOLUME control/on-off switch (on the instrument panel) and to terminal 3 of the MARKER BEACON indicator lamp. With the MARKER BEACON VOLUME control/on-off switch rotated clockwise, +28 vdc is applied through J506 pin N to the R-1041A/ARN marker beacon receiver through P501 pin E.

b. Audio Distribution. Audio signals from the marker beacon receiver are routed from P501 pin C through P506 pin P (bulkhead receptacle), to terminal 3 of the MARKER BEACON VOLUME control (R18). See figure 2-1. The signal now flows from the wiper (terminal 4) of the MARKER BEACON VOLUME control back to and through P506 pin R to TB20 terminal 8. From TB20 terminal 8 (see figure FO-3), the signal is routed to pin HH of the associated connector on each ICS control panel where it is amplified and routed to the respective headset.

2–11. Radio Receiving Set AN/ARN-82, VHF Navigation (VOR) Facility (figs. FO-3 and FO-11)

a. Power Distribution (Figure FO-11). Positive 28 vdc is applied through the VHF NAV OMNI circuit breaker, when depressed, to P306 pin J of the RT-1388( )/ARN-82 receiver and to P311 pin Z of the C-6873/ARN-82 control panel. Depressing COURSE IND circuit breaker (CB98) on the ac circuit breaker panel applies 26 volts, 400 Hz to TB1 terminal 12. From this point it is distributed to P403 pins 21 and 34 of the pilot's ID-998/ASN radio magnetic indicator, to P409 pin S of the copilot's ID-250A/ARN course indicator, and to P306 pin G of the ARN-82 receiver.

b. Nav Resolver Signal Distribution. Nav resolver signals are routed from P304 pins H, C, D, E, F and G of the ARN-82 receiver to P1601 pins H, C, D, E, F and G respectively, of the ID-1347/ARN-82 course indicator.

c. VOR Localizer Deviation Signal Distribution. Right and left deviation signals are routed from P304 pins m and n of the ARN-82 receiver through the normally closed contacts of the DEV-IND POINTER relay K53 (in at terminals D3 and C3, respectively, and out terminals D2 and C2 respectively) to P1601 pins J and K, respectively, of the ID-1347/ARN-82 course indicator.

NOTE

Homing signals from the ARC-54 fm facility override ARN-82 localizer deviation and warning flag signals by actuation of relays K53 and K54 when HOME (homing mode) is selected on the ARC-54 fm control panel.

d. Warning Flag Signal Distribution. Warning flag signals from the ARN-82 receiver P304 pins a and b are routed through the normally closed contacts of the DEV-IND FLAG relay K54 (in at terminals D3 and C3, respectively, and out terminals D2 and C2 respectively) to P1601 pins N and P, respectively, of the ID-1347/ARN-82 course indicator. Refer to note in previous step c.

e. To/From Signal Distribution. To/From signals are routed from P304 pins Z and Y of the ARN-82 receiver to P1601 pins T and U of the ID-1347/ARN-82 course indicator.

f. Magnetic Heading Signal Distrioution. Magnetic heading signals (synchro output) from P306 pins C and D of the ARN-82 receiver are routed to P403 pins 18 and 19, respectively, of the ID-998/ASN radio magnetic indicator.

g. VOR Heading Signal Distribution. Vor heading signals (synchro output) from P306 pins H and K of the ARN-82 receiver are routed to TB1 terminals 7 and 6, respectively. From TB1 terminals 7 and 6, a parallel circuit is routed to the ID-250A/ARN course indicator (P409 pins T and U) and the ID-998/ASN radio magnetic indicator (P403 pins 29 and 30).

h. Audio Signal Distribution. Received audio signals (audio hi) are routed from P304 pin L of the ARN-82 receiver (see figure FO-11) through the ARN-82 control panel, in at P311 pin b and out P311 pin d, to TB19 terminal 7. From TB19 terminal 7 (see figure FO-3), the signals are distributed through associated terminal blocks to pin UU of the associated connector on each ICS control panel where it is amplified and routed to the respective headsets.

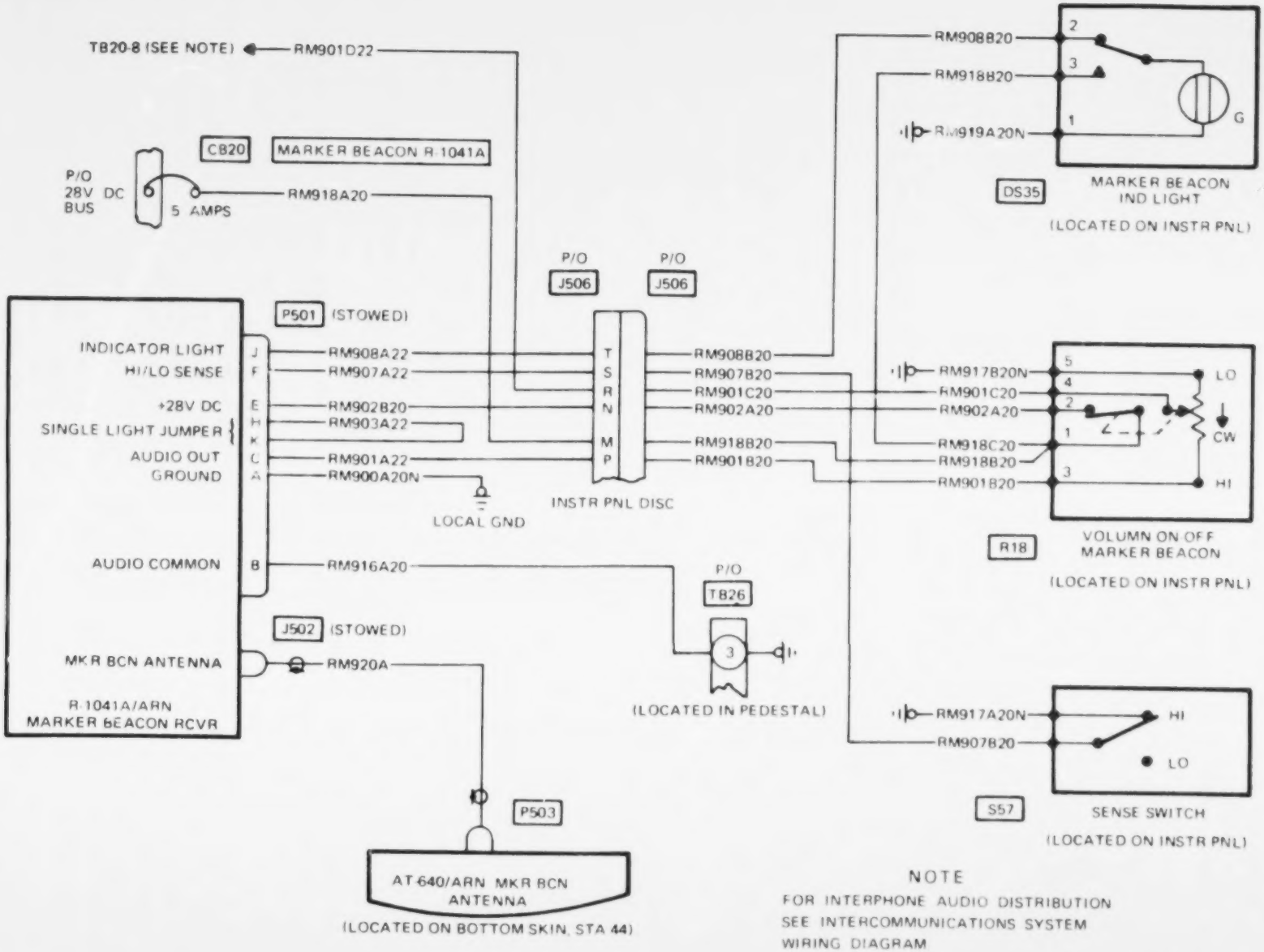

Figure 2-1. Marker Beacon Facility, R-1041A/ARN.

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2–12. Transponder Set AN/APX-72, Transponder (IFF) Facility

(figs. FO-3 and FO-12)

a. Power Distribution (Figure FO-12). Primary operating power (+28 vdc) is applied through two IFF APX-( ) circuit breakers, when depressed, to the iff transponder facility. Depressing the 10-ampere IFF APX-( ) circuit breaker (CB17) routes +28 vdc to P916 pin 2 of the RT-859/APX-72 receiver-transmitter and to TB19 terminal 1. The receiver-transmitter in turn routes +28 vdc out P916 pin 6 to P911 pin 31 of the KIT-1A/TSEC transponder computer. From TB19 terminal 1, +28 vdc is routed simultaneously to P917 pin 51 of the C-6280/APX iff transponder control panel, and through P506 pin B to terminal 3 of the IFF MODE 4 indicator light and terminal 2 of the iff CODE HOLD switch both of which are on the instrument panel. Depressing the 5-ampere IFF APX-( ) circuit breaker (CB18) routes +28 vdc to P908 pin 1 of the TS-1843/APX transponder test set.

b. Code Select Signals. The mode 1 A_1 code select signal is routed from P917 pin 26 on the iff transponder control panel to P916 pin 40 on the iff transponder receiver-transmitter. The mode 1 A_2 signal is routed from P917 pin 27 to P916 pin 39. The mode 1 A_4 signal is routed from P917 pin 28 to P916 pin 38. The mode 1 B_1 signal is routed from P917 pin 29 to P916 pin 37. The mode 1 B_2 signal is routed from P917 pin 30 to P916 pin 36. The mode 3/A A_1 signal is routed from P917 pin 32 to P916 pin 29. The mode 3/A A_2 signal is routed from P917 pin 33 to P916 pin 28. The mode 3/A A_4 signal is routed from P917 pin 35 to P916 pin 27. The mode 3/A B_1 signal is routed from P917 pin 36 to P916 pin 26. The mode 3/A B_2 signal is routed from P917 pin 37 to P916 pin 25. The mode 3/A B_4 signal is routed from P917 pin 38 to P916 pin 24. The mode 3/A C_1 signal is routed from P917 pin 15 to P916 pin 43. The mode 3/A C_2 signal is routed from P917 pin 16 to P916 pin 44. The mode 3/A C_4 signal is routed from P917 pin 17 to P916 pin 50. The mode 3/A D_1 signal is routed from P917 pin 18 to P916 pin 56. The mode 3/A D_2 signal is routed from P917 pin 19 to P916 pin 57. The mode 3/A D_4 signal is routed from P917 pin 20 to P916 pin 58.

c. MASTER Switch Control Signals. The power relay control signal is routed from P917 pin 11 on the iff transponder control panel to P916 pin 20 on the iff transponder receiver-transmitter. The standby control signal is routed from P917 pin 8 to P916 pin 16. The sensitivity control signal is routed from P917 pin 10 to P916 pin 14. The emergency control signal is routed from P917 pin 5 to P916 pin 19.

d. Mode Test Signals. The test mode control signal is routed from P917 pin 24 on the iff transponder control panel to P916 pin 4 on the iff transponder receiver-transmitter. The mode 1 test signal is routed from P908 pin 4 on the transponder test set to P917 pin 40 on the iff transponder control panel. The mode 2 test signal is routed from P908 pin 5 to P917 pin 41. The mode 3/A test signal is routed from P908 pin 6 to P917 pin 43.

e. Mode 1 Enable Signals. The mode 1 enable signal is routed from P917 pin 25 of the iff transponder control panel xto P916 pin 22 of the iff transponder receiver-transmitter. The mode 2 enable signal is routed from P917 pin 9 to P916 pin 15. The mode 3/A enable signal is routed from P917 pin 6 and routed to P916 pin 18.

f. Mode 4 Signals. The mode 4 video-out signal is routed from P916 pin 45 on the iff transponder receiver-transmitter to P911 pin 2 on the transponder computer. The mode 4 enable signal is routed from P916 pin 46 to P911 pin 3. The mode 4 reply signal is routed from P911 pin 1 to P916 pin 47. The mode 4 disparity signal is routed from P911 pin 4 to P916 pin 48. The mode 4 disable signal is routed from P917 pin 23 on the iff transponder control panel to P911 pin 14 on the transponder computer. The mode 4 A/B select signal is routed from P917 pin 48 to P911 pin 9.

g. Other Signals. The monitor control signal is routed from P917 pin 45 on the iff transponder control panel to P908 pin 3 on the transponder test set. The test set light signal is routed from P917 pin 46 to P908 pin 8. The refuel hold signal is routed from P917 pin 1 to P911 pin 37 on the transponder computer. The test bit control signal is routed from P917 pin 3 to P911 pin 19. The reply light enable signal is routed from P917 pin 42 to P916 pin 34. The I/P control signal is routed from P917 pin 2 to P916 pin 21. The zeroize return signal is routed from P917 pin 22 to P911 pin 33. The code 2 zeroize and alarm signal is routed from P911 pin 17 on the trans-

ponder computer to P916 pin 52 on the iff transponder receiver-transmitter. The caution light enable signal is routed from P916 pin 53 to P911 pin 28. The computer hold signal is routed from S62 termianl 5 (iff CODE HOLD switch) through P506 pin A to P911 pin 32 on the transponder computer. The caution light signal is routed from P911 pin 30 to the IFF FAILURE relay, K68 terminal X1.

h. Audio Distribution. Audio signals from iff transponder set are routed out P916 pin 9 to J600 pin 22 of the impedance matching network (A16). From J600 pin 22, the audio signals are routed through TB20 terminal 9 to pin FF on each associated ICS control panel where it is amplified and routed to the respective headsets.

2-12.1. Receiver, Radio R-1963/ARN (Glideslope/Marker Beacon) Facility

(fig. FO-14)

a. Glideslope Section.

(1) Power Distribution. When the R-1963 circuit breaker is depressed and the power switch on Control, C-6873B is set to PWR, +28 volts dc is applied through pin T of J311 (C6873B/ARN-82 control panel receptacle) to J1 pin 5 of Receiver R-1963/ARN.

(2) Signal Distribution. After placing the power switch on Control, C-6873B/ARN-82 to PWR, the R-1963/ARN receives and processes glideslope signals over the frequency range of 329.15 to 335.00 MHz. The glideslope signals are converted to dc voltages in the receiver and routed to the horizontal pointer and GS alarm flag of Indicator, ID-1347C/ARN-82. The glideslope deviation signal (+up) is routed from pin 16 of the receiver, through terminal 4 of relay K53 to pin L of J1601 (Indicator, ID-1347C/ARN-82). The glideslope deviation signal (+down) is routed from pin 34 of the receiver through terminal 7 of relay K54 to pin M of J1601 (Indicator, ID-1347C/ARN-82). The glideslope flag alarm signals are routed through pins 19 and 16 of relay K54 to pins S and R respectively of J1601 (Indicator, ID-1347C/ARN-82).

NOTE

Homing signals from the ARC-54 fm facility override ARN-82 localizer deviation and warning flag signals, and R-1963 glideslope deviation and warning flag signals, by actuation of relays K53 and K54 when HOME (homing mode) is selected on the ARC-54 fm control panel.

b. Marker Beacon Section.

(1) Power Distribution. When the R-1963 circuit breaker is depressed and the power switch on Control, C-6873B/ARN-82 is set to PWR, +28 volts dc is applied through pin T of J311 (C-6873B/ARN-82 control panel receptacle) to J1 pin 5 of Receiver R-1963/ARN. The signal is routed out J1 pin 6, through J506 pin T, to terminal 2 of the marker beacon volume control on/off switch on the pilot's instrument panel. With the marker beacon volume control on/off switch on, the instrument panel rotated clockwise, +28 volts dc is applied, through terminal 1 of the marker beacon volume control on/off switch, to terminal 1 of the marker beacon indicator light.

(2) Signal Distribution. 75 MHz signals, modulated by one of three frequencies (400, 1300 or 3000 Hz) are processed by the receiver and converted to dc voltages. The signal is routed out J1 pins, 3, 20 or 21 (depending on modulation frequency), through J506 pin M, to terminal 2 of the marker beacon indicator light.

(3) Audio Distribution. Audio signals from the Receiver, R-1963/ARN are routed from J1 pins 7 and 8 through J506 pins P and C, to terminals 3 and 5 of the marker beacon volume control. The signal then flows from the wiper (terminal 4) of the volume control, back through pin R of J506 to terminal 8 of TB-20, and to pin HH of all signal distribution panels.

2-12.2. Receiving Set, Radio AN/ ARN-123(V) (VOR/ILS) Facility

(fig. FO-15)

a. Power Distribution. When the ARN-123 circuit breaker is depressed, +28 volt dc is applied to pin 6 of J1 at Control, C-10048/ARN-123(V). Depressing the COURSE IND circuit breaker (ac) applies 26 volts, 400 Hz through TB1 terminal 12, to J12002 pin 18 of Receiver, R-2023/ARN-123. From this point, it is distributed to P405, pins 21 and 34 of the ID-998/ASN and to P409 pin S of the ID-250A/ARN. Turning the OFF/NAV VOL switch on the control panel clockwise, applies +28v dc to pin 21 of J12002 (Receiver R-2023/ARN-123). Turning the OFF/MB VOL switch on the control panel clockwise, applied −28v dc through pin T of J506 to terminal 1 of the marker beacon indicator light.

b. NAV Resolver Signal Distribution. NAV resolver signals are routed from J12002 pins C, B, A, D, E, G and F of the ARN-123 receiver to P1601 pins C, B, A, D, E, G, and F, respectively, of Indicator ID-1347C/ARN-82.

c. VOR/Localizer Deviation Signal Distribution. Right and left deviation signals are routed from J12002 pins 12 and 30 of the ARN-123 receiver through the normally closed contacts of the DEV-IND POINTER relay K53 (in at terminals 14 and 11, respectively, and out terminals 10 and 7 respectively) to P1601 pins J and K, course indicator.

d. Glideslope Deviation Signal Distribution. Up and down deviation signals are routed from J11001 pins 24 and 19 through the normally closed contacts of relay K53 (in at terminals 5 and 8 respectively, and out

terminals 4 and 7, respectively) to P1601 pins L and M respectively.

NOTE

Homing signals from the ARC-54 fm facility override ARN-123 localizer/glideslope deviation and warning flags by actuation of relays K53 and K54 when HOME (homing mode) is selected on the ARC-54 fm control panel.

e. VOR/Localizer Warning Flag Signal Distribution. Warning flag signals from the ARN-123 receiver J12002 pins 29 and 37 are routed through the normally closed contacts of the DEV-IND FLAG relay K54 (in at terminals 11 and 14, respectively) to P1601 pins P and N respectively, of the ID-1347C/ARN-82 course indicator. Refer to note in previous step d.

f. Glideslope Warning Flag Signal Distribution. Warning flag signals from the ARN-123 receiver J11001 pins 11 and 20 are routed through relay K54 (in at terminals 8 and 5 respectively, and out terminals 7 and 4, respectively) to P1601 pins R and S, respectively. Refer to note in previous step d.

g. To/From Signal Distribution. To/From signals are routed from J12002 pins 31 and 14 of the ARN-123 receiver to P1601 pins T and U respectively of the ID-1347C/ARN-82 course indicator.

h. Magnetic Heading Signal Distribution. Magnetic heading signals (synchro output) from J12002 pins 7 and 6 of the ARN-123 receiver are routed to P405 pins 18 and 19, respectively, of the ID-998/ASN radio magnetic indicator.

i. VOR Heading Signal Distribution. VOR heading signals (synchro output) from J11001 pins 12 and 13 of the ARN-123 receiver are routed to TB1 terminals 7 and 6, respectively. From TB1 terminals 7 and 6, a parallel circuit is routed to the ID-250A/ARN course indicator (P405 pins T and U) and the ID-998/ASN radio magnetic indicator (P403 pins 29 and 30).

j. Marker Beacon Signal Distribution. 75 MHz signals, modulated by one of three frequencies (400, 1300 or 3000 Hz) are processed by the receiver and converted to a dc voltage. The signal is routed out J12002 pin 1, 20 or 25 (depending on modulation frequency) through J506 pin S to terminal 2 of the marker beacon indicator light.

k. Audio Distribution. The VOR and localizer audio signals (audio hi) are routed from pin 15 of J12002 (Receiver R-2023/ARN-123(V) control panel receptacle). The signals are routed through the OFF/NAV VOL control of the control panel, out pin 2 of J1 to TB19 terminal 7 and Impedance Matching Network A16 pin S. From TB19, the signals are routed to all distribution panels where the signals are amplified and routed to all headsets. The marker beacon signal (audio hi) is routed from pin 4 of J12002 to pin 19 of J1. The signal feeds through the OFF/MB VOL switch on the control panel, out pin 18 of the J1 to pin 8 of TB20. From TB20, the signal is routed to all distribution panels where the signals are amplified and routed to all headsets.

2-12.3. Altimeter Set, Electronic AN/APN-209 (Radar Altimeter) Facility

(fig. FO-14)

a. Power Distribution. Depressing the RADAR ALTM APN-209 circuit breaker on the overhead circuit breaker panel applies 28V dc to pin 1 of J1 on remote height indicator (RI) ID-1917/APN-209 and to pin 9 of J1 on Indicator, receiver-transmitter (IRT) RT-1115/APN-209.

b. Lighting.

(1) Digital readout and warning lamps. Depressing the INST PANEL LIGHTS circuit breaker applies dc power through relay K100 to pin 7 of J1 on the IRT and to pin 6 of J1 on the RI. When the pilot's instrument panel dimmer control (on overhead panel) is in the OFF position, relay K100 applies 28V dc to the IRT and the RI. When the pilot's instrument panel dimmer control is not in OFF position, relay K100 applies 0-28V dc from terminal 9, TB13 (located behind instrument panel) to the IRT and 0-28V dc from terminal 4, TB13 to the RI. Voltages at terminals 4 and 9 of TB13 are adjustable at the pilot's and copilot's dimmer controls, respectively.

(2) Integral lighting. Two 5-volt power supplies (MWO 55-1500-219-30-8) convert 28 volt dc to 5-volt dc for integral lighting of the RI and IRT.

c. Signal Distribution. The radar altimeter set incorporates a high-resolution pulse radar that provides a measurement of absolute clearance over all types of terrain. The operation of the system is based on the precise measurement of the time for an electromagnetic energy pulse to travel from the aircraft to the terrain below and return. The time of the pulse transmission is compared to the time of the pulse arrival and the resultant time differential is processed to provide the range information. The signal processing and computing circuitry and the use of separate transmitting and receiving antennas permit altitude measurement down to touchdown. Operation to touchdown is accomplished by providing sufficient electromagnetic isolation between the transmitter and receiver antennas, which allows reception of early reflections from the ground while the transmitted pulse is still being radiated. The system uses a leading-edge tracking principle which measures altitude only from the return along the vertical incidence vector and thereby rejects multiple path returns. The resultant altitude measurement represents the nearest terrain to the aircraft.

Section II. CONFIGURATION SYSTEMS BLOCK DIAGRAM ANALYSIS

2-13. General

Block diagram analysis of the entire electronic equipment configuration and the individual facilities that are contained in the electronic equipment configuration are covered in TM 11-1520-210-20-1. Refer to appendix A for separate technical manuals covering individual electronic equipment components.

Section III. STAGE ANALYSIS

2-14. Communication Junction Box (See TM 1520-210-20-1 for wiring diagram.)

The communications junction box, located on the aft end of the pedestal, contains terminal blocks (TB19 and TB20) and the impedance matching network (A16). Primary power, operating voltage, transmit control, transmit audio, and received audio circuits of various electronic equipment facilities are interconnected at the terminal blocks. The impedance matching network provides proper loading of audio signals to and from each of the ICS control panels.

2-15. Audio Threshold Detector (Z20)
(fig. FO-2)

The audio threshold detector (Z20), located on the cover panel of the communications junction box on the aft end of the pedestal, contains special transformer coupling networks and a relay network. The transformer coupling networks couple the radio transmit audio signals to the appropriate radio facilities and block low amplitude audio signals which generally occur from crossfeed or crosstalk. The relay circuits prevent inadvertent transmission of crossfeed or crosstalk KY-28 secure voice audio on another radio facility by preventing secure voice audio reception to the operator transmitting on another radio facility.

2-16. RMI Display
(fig. FO-13)

a. Functional Operation. The electronic control amplifier provides the necessary amplification for control signals to drive motor, gearing, rotors and heading dial of the ID-998/ASN compass indicator (pilot's radio magnetic indicator). The electronic control amplifier and compass indicator, (containing a heading servo control transformer and a motor-generator) form a servo loop which is stabilized by the generator (part of motor-generator) feed-back signal to the electronic control amplifier. Any signal on the rotor of the heading servo transformer is applied to the electronic control amplifier. The output of the electronic control amplifier is used to drive the motor-generator. The motor-generator is mechanically coupled to and drives the ID-998/ASN indicator heading dial and the rotors of all the synchros in the indicator with the exception of the rmi synchros. Rotation of the motor continues until the rotor of the heading servo control transformer drives to a null.

NOTE

A signal is induced in the rotor of the heading servo control transformer for any of three reasons:
(1) Misalignment of the gyro reference synchro located in the directional control gyro unit, and the heading servo control transformer when the system is initially turned on.
(2) Rotation of the synchronizing knob located on the lower right corner of the ID-998/ASN indicator.
(3) Changes in the helicopter heading.

Initial precessing of the gyro (because of initial misalignment) will cause a cross or a dot to appear in the annunciator window (upper right corner of the ID-998/ASN indicator). As the directional control gyro is precessed, it rotates the rotor of the reference synchro in the base of the directional control gyro. This causes rotation of the reference vector in the stator of the heading servo control transformer which in turn induces a displacement signal in its rotor. This signal is applied to the electronic control amplifier which is part of a servo loop circuit and ultimately synchronizes the heading dial to magnetic alignment and clears the annunciator window. Rotation of the synchronizing knob in the lower right corner of the indicator causes a signal to be induced in the rotor of the slaving synchro in the indicator, which in turn causes a cross or dot to appear in the annunciator window and starts a slow precession of the gyro. The stator of the heading servo control transformer may be physically rotated, by use of the synchro knob, without introducing a heading error. The reference synchro in the base of the directional control gyro furnishes a stable, rather then magnetic reference to the ID-998/ASN indicator. Compass system synchronization may be accomplished by manual rotation of the synchro knob. Changing the heading of the helicopter causes the reference vector to shift in the heading servo synchro stator in the ID-998/ASN indicator. This induces a signal in the rotor of the heading servo control transformer causing the motor to drive the heading dial and follow the changing heading of the helicopter.

b. Electronic Control Amplifier (Figure 2-2)

(1) Dc power supply. Power transformer T202 is a 400-Hz autotransformer which drives a conventional full-wave rectifier. A tap on the transformer provides a 26-volt signal (at zero degrees reference phase) to energize part of the motor-generator in the ID-998/ASN compass indicator. Line voltage is applied, through phase-shift capacitor C204, to the fixed field of the motor. Dc power is continuously applied to the microamp meter movement which moves an arm for the power failure indicator on the lower right corner of ID-998/ASN indicator.

(2) Amplifier channel. The electronic control amplifier contains a two-stage, push-pull transistor amplifier. The amplifier channel provides necessary power to operate the motor (part of the motor-generator) in the ID-998/ASN indicator when the AN/ASN-43 compass system is not synchronized.

NOTE

A 400-Hz input signal is applied to transformer T201A. Transformer T201A is coupled to a push-pull voltage amplifier consisting of transistors Q201 and Q202. The input signal is in series with a feedback voltage from the generator section of the external motor-generator. The net signal input is the difference between input signal voltage and feedback voltage. The feedback prevents excessively rapid rotation of motor-generator rotor. After voltage amplification, the signal is coupled through transformer T201B to a push pull power amplifier consisting of transistors Q203 and Q204, and is applied to the control field of the external motor-generator.

c. Detailed Circuit Operation.

(1) The following data flow can be traced through the schematic wiring diagram (Figure 2-2).

(2) Autotransformer T202 has a 115 vac input. Full wave dc rectification is accomplished by CR201 and CR202 Capacitor C205 (60 uf) provides effective filtering for smoothing out 800-Hz ripple frequency 400-Hz source.

(3) Under zero input condition, current flows through R210, R206, emitter to base of Q202, the lower half of secondary of T201A,

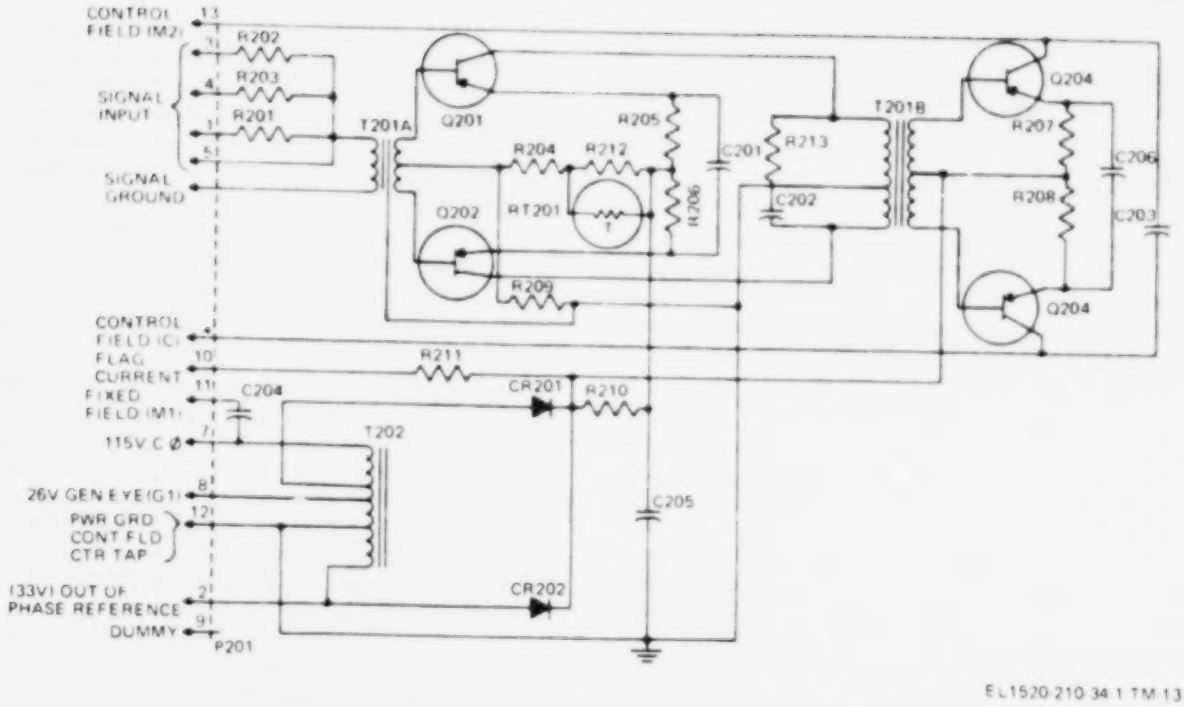

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Figure 2-2. Electronic Control Amplifier AM-3209/ASN.

through R209, to ground. Similarly, current flows through R210, R205, emitter to base of Q201, upper half of secondary of T201A through R209, to ground. This places a forward bias on emitter to base circuits of Q201 and Q202. At the same time, current also flows through the following: R210, RT201 and R212 in parallel, R204, upper and lower halves of secondary of T201A, base to collector circuits of Q201 and Q202, and upper and lower halves of primary of transformer T201B to ground. This places reverse bias on collector to base circuits of Q201 and Q202. At the same time, current flows from B+ through both halves of secondary of transformer T201B, base to collector circuits of Q203 and Q204, and through both halves of motor winding to ground. This places reverse bias on collector to base circuits of Q203 and Q204.

NOTE

RT201 is a negative temperature coefficient thermistor, which keeps the bias currents constant under varying temperature conditions.

(4) When an input signal is applied (consider the instant that the top of the secondary of transformer T201A is positive and bottom negative), current flows from top to T201A through base to emitter circuit of Q201, capacitor C201, and emitter to base circuit of Q202 to bottom of transformer T201A. This current flow decreases forward bias on emitter to base circuit of Q201, because the current flow is in opposition to current flow creating the forward bias. A decrease in forward bias increases impedance of Q201. Conversely, current flow through Q202 increases the forward bias, because this current is aiding the current creating the forward bias on the emitter to base circuit of Q202. An increase in forward bias causes impedance of Q202 to decrease. Therefore, during first half cycle of input, signal impedance of Q201 and Q202 will be increasing and decreasing respectively; varying as the instantaneous magnitude of the signal varies. This permits a dc, varying inversely as the impedance varies, to flow through emitter to collector circuits of Q201 and Q202 and both halves of primary of transformer T201B, to ground. Since impedance of Q202 is lower than impedance of Q201, the current flowing through lower half of primary of T201 will be greater than upper half. The difference between those currents will induce a voltage into secondary of T201B, polarity of which, for first half cycle, will be negative at the top and positive at the bottom of the secondary.

(5) Similar to the previous stage, current will flow from bottom of secondary T201B, through base to emitter of Q204, capacitor C206 (which is effectively a short for ac), emitter to base circuit of Q203 to top of secondary to T201B. This current flow will create reverse bias on emitter-to-base circuit of Q204, and forward bias on emitter-to-base circuit of Q203. The impedance of Q204 and Q203 will increase and decrease respectively, at the rate that the magnitude of the input signal is varying. This permits a dc, varying inversely as the impedance varies, to flow through emitter to collector circuits of Q204 and Q203 and both halves of motor winding to ground. Since impedance of Q203 is lower than Q204, current flowing through upper half of motor winding will be greater than current flowing through the lower half. The difference between these will create a magnetic field that will cause the motor to turn in one direction. Since the motor is a two phase induction type and if this explanation had been started with a signal of opposite phase, resultant motor rotation would be in the opposite direction.

CHAPTER 3

DIRECT SUPPORT MAINTENANCE

Section I. GENERAL MAINTENANCE TECHNIQUES

3–1. General Instructions

The direct support electronic equipment configuration maintenance procedures in this manual supplement the organizational maintenance procedures in TM 11-1520-210-20-1. These procedures also supplement the separate technical manuals on the electronic equipments to provide complete repair and maintenance instructions. The systematic maintenance procedures begin with the functional operation and sectionalization checks which can be performed by organizational and direct support maintenance personnel within the helicopter and are extended to removal and replacement of units or components from the helicopter. When the components are removed from the helicopter, the systematic maintenance procedures continue with the bench maintenance of the individual electronic equipment components. Section II of this chapter provides direct support troubleshooting and repair of the electronic equipment configuration within the helicopter and supplement the organizational maintenance procedures. Section III provides direct support troubleshooting of electronic equipment components that have been removed from the helicopter.

WARNING

When servicing the electronic equipment configurations in helicopters, Army Model UH-1H, be extremely careful of high voltages present in various electronic equipment components. Before performing resistance checks, making any connections, or performing maintenance on the equipment, always turn off or disconnect the power and discharge any high voltage capacitors in the equipment.

WARNING

Do not touch or stand near radiating antennas; serious RF burns may result.

3–2. Organization of Troubleshooting Procedures

a. General. Troubleshooting the electronic equipment configuration in Army Model UH-1H helicopters is performed in three steps. The first step, sectionalization, is to trace the fault to a facility used in a system of the configuration. The second step, localization, is to trace the trouble to the defective unit that is part of the faulty facility and/or associated junction box, cabling, or wiring. When performing bench maintenance on a removed electronic equipment component, localization includes tracing the fault to a defective stage or module within the component. The third step, isolation, is to isolate the trouble within the component to a defective part.

b. Sectionalization. Listed below is a group of tests arranged to reduce unnecessary work and to aid in tracing troubles to the defective facility.

(1) Visual inspection. Visual inspection is used to locate faults before operating or testing circuits. The seating of all component connectors, connections to switches and circuit breakers, connections on terminal boards, connections to antennas, etc, should be observed and an attempt made to locate the fault.

(2) Operational tests. Operational tests frequently indicate the general location of trouble. In many instances, the tests will help in determining the exact nature of the fault. The periodic preventive maintenance checks and services chart (TM 11-1520-210-20-1) may be used as an operational test.

c. Localization. The procedures listed below are used for localizing troubles within an electronic system or facility to the faulty component or unit.

(1) Electronic configuration performance tests. The periodic preventive maintenance checks and services chart tests (TM 11-1520-210-20-1) are used in conjunction with the troubleshooting charts to locate faulty basic signal equipment items.

(2) Voltage and resistance measurements. Use the configuration voltage and resistance charts (paragraphs 3-17 and 3-18) to find normal readings, and compare them to the actual readings taken.

(3) Troubleshooting chart. The troubleshooting chart will aid in localizing the trouble to a component or subassembly. If the corrective measures indicated do not restore normal equipment operation, troubleshooting the cording and cabling circuits may be necessary. When the trouble is isolated to an installation item, remove the item from the helicopter and replace it with an installation item known to be in working order. When the trouble is isolated to a basic signal equipment, remove the equipment from the helicopter for bench testing, and replace it with one known to be in good working order. Note on the repair tag how the equipment performed and what corrective measures were taken.

(4) Intermittent troubles. In all tests, the possibility of intermittent troubles should not be overlooked. If present, this type of trouble often may be made to appear by tapping or jarring the equipment and checking wiring and connections to the components.

d. Isolation. After the trouble has been localized (para 3-2, step c), the methods in the following substeps (1) through (4) will aid in isolating the trouble to a defective circuit element within a component.

(1) Voltage measurements. Most of the electronic equipment is transistorized. When measuring voltages, use tape or sleeving (spaghetti) to insulate the entire test probe, except for the extreme tip. A momentary short circuit can ruin a transistor. Use the same or equivalent multimeter specified on the voltage and resistance diagrams.

(2) Resistance measurements. Make resistance measurements in this equipment only as directed on voltage and resistance diagrams or charts. When using the multimeter, set it to the resistance range specified on these diagrams on charts; otherwise, the indications obtained will be inaccurate.

CAUTION

Before using any multimeter to test transistors or transistor circuits by measuring resistances, check the open-circuit voltage across the multimeter test leads. Do not use the multimeter if the open-circuit voltage exceeds 1.5 volts. Also, since the RX1 range normally connects the multimeter internal battery directly across the test leads, the comparatively high current (50 ma or more) may damage the transistor under test. As a general rule, the RX1 range of any multimeter should not be used when testing low-power transistors.

(3) Test points. The modules in the AN/ARC-102 components are equipped with test jacks to facilitate connection of test equipment to various units. The test points should be used whenever possible to avoid needless disassembly of equipment.

(4) Intermittent troubles. In all the tests, the possibility of intermittent troubles should not be overlooked. If present, this type of trouble often may be made to appear by tapping or jarring the equipment. Make a visual inspection of the wiring and connections to the modules of the component. Minute cracks in printed circuit board can cause intermittent operation, and may be located by means of a magnifying glass. Continuity measurements of printed conductors may be made by using techniques ordinarily used on hidden conventional wiring; observe the multimeter resistance measurement precautions discussed in preceding substep (2).

(5) Resistor and capacitor code diagrams. Resistor capacitor color code diagrams (Figure FO-1) are provided to aid maintenance personnel in determining the value, voltage rating, and tolerance of capacitors and resistors.

3–3. Test Equipment and Tools Required

The test equipment and tools required for troubleshooting the electronic configuration in UH-1H series helicopters are as follows:

a. Multimeter AN/URM-105.

b. Tool Kit, Electronic Equipment TK-100/G.

c. Tool Kit, Electronic Equipment TK-101/G.

d. Tool Kit, Electronic Equipment TK-105/G.

e. Multimeter, TS-352(*)/U.

f. Wattmeter AN/URM-120.

g. Maintenance Kit, Electronic Equipment MK-693A.

h. Test Set, Transponder, AN/APM-123A(V).

i. Tool, Contact, Insert/Extract IVAS 1664-120.

Section II. CONFIGURATION INTERUNIT TROUBLESHOOTING

3–4. Introduction

a. When a malfunction of the electronic equipment occurs, the first step in correcting the trouble is to sectionalize the cause to a particular unit. Perform the operational checks in the periodic preventive maintenance checks and services chart (TM 11-1520-210-20-1). If the operational checks and supporting troubleshooting chart are inconclusive as to which unit or item is causing the trouble, perform the direct support in aircraft troubleshooting procedures in this section for the particular defective facility.

b. The direct support in aircraft troubleshooting procedures involves the use of special portable test equipments that are not allocated at the organizational maintenance level. Since the controls for the electronic equipments and the other basic components are remotely located, in some instances the troubleshooting procedures in this section require more than one person. The organizational maintenance repairman should remain in the cockpit and operate the controls in accordance with commands from the direct support maintenance repairman. The direct support maintenance repairman will then connect the test equipments to the equipment components and perform the required tests.

3–5. Preparatory Steps for Facility Performance Tests and Troubleshooting

a. Ensure helicopter is at least 200 feet from any large electrical conducting installation or object.

b. Connect an auxiliary power unit to the external power receptacle.

c. Reset all circuit breakers on the dc circuit breaker panel.

3–6. Troubleshooting Interphone Facility

a. Interphone Facility Performance Test. Performance tests provided in the following substeps do not cover transmission or reception on any radio set. For performance tests of the interphone facility in relationship to transmission or reception on any radio set, refer to the appropriate radio set facility performance test provided in this chapter.

(1) Ensure the INTER COM PLT & CREW-R and INTER COM CPLT & CREW-L circuit breakers are depressed and engaged.

(2) Position the controls and switches on each ICS control panel as follows:

Rotary selector switch	ICS
Mixing switches (7)	OFF
HOT MIKE switch	OFF
VOL control	Midrange

(3) Readjust the VOL control as necessary until a slight rushing noise is heard in the headsets.

(4) Position the trigger switch on the pilot's cyclic control grip to ICS (first detent) and speak into the headset microphone. Sidetone should be heard in the pilot's headset and received audio should be heard in the headsets at the other three stations. Sidetone and received audio should be clear and distinct.

NOTE

Interphone (ICS line only) sidetone at the transmitting station is of a lower volume level than the ICS received audio at the other three stations.

(5) At the other three stations adjust the VOL control on the ICS control panel cw and ccw while received audio is being heard. The VOL control should vary the volume level of the received audio as heard in the headsets.

(6) Position the trigger switch on the pilot's cyclic control grip to RADIO (second detent) and speak into the headset microphone. Sidetone should be heard in the pilot's headset and received audio should be heard in the headset at another station.

(7) Depress the pilot's foot switch and speak into the headset microphone. Sidetone should be heard in the pilot's headset and received audio should be heard in the headset at another station.

(8) Repeat previous substeps (4), (6), and (7) at the copilot's station.

(9) Repeat previous substep (7) at the right and left crewmembers' stations.

(10) At the left crewmember's station, depress the hand-operated push-to-talk switch (located on the headset cordage) and speak into the headset microphone. Sidetone should be heard in the left crewmember's headset and received audio should be heard at another station.

(11) Repeat previous substep (10) at the right crewmember's station.

(12) On the right crewmember's ICS control panel, position the HOT MIKE switch to HOT MIKE (on) and the rotary selector switch to any one of the radio facilities, and speak into the headset microphone without keying the ICS control panel by another method. Sidetone should be heard in the right crewmember's headset and received audio should be heard at another station.

NOTE

In the following substeps, ensure that the radio facility selected is not turned on.

(13) Position the rotary selector switch to positions 1 through 5 (one position at a time), key the ICS control panel with the foot switch, and speak into the headset microphone. Neither sidetone nor received audio should be heard at any station when the ICS control panel is keyed.

(14) Repeat previous substeps (12) and (13) at the left crewmember's, copilot's, and pilot's station.

(15) At all four stations, position the HOT MIKE switch to OFF (down).

(16) On the pilot's cyclic control, depress the trigger switch to ICS (detent 1) and speak into the headset microphone. Sidetone should be heard in the pilot's headset and received audio heard at another station.

(17) Depress the trigger switch to RADIO (detent 2) and speak into the headset microphone. Neither sidetone nor received audio should be heard at any station.

(18) Repeat previous substeps (16) and (17) at the copilot's station.

(19) At all four stations, return the ICS control panel rotary selector switch to ICS.

b. Interphone Facility Troubleshooting Chart.

Symptom	Probable cause	Corrective measures
1. No audio reception, sidetone, nor transmission at pilot's and right crewmember's stations.	Defective INTER COM PLT & CREW-R circuit breaker (CB24).	Replace defective circuit breaker.
2. No audio reception, sidetone, nor transmission at copilot's and left crewmember's stations.	Defective INTER COM CPLT & CREW-L circuit breaker (CB23).	Replace defective circuit breaker.
3. No audio reception nor sidetone heard at one of the four stations.	*a.* Defective headset.	*a.* Try same headset at another station; if good, refer to next probable cause. Replace headset if result is the same at another station.
	b. Defective headset amplifier in ICS control panel.	*b.* Replace defective ICS control panel.
	c. Open headset circuit wiring.	*c.* If replacing headset and ICS control panel does not correct the malfunction, make continuity check of headset lines between ICS control panel and headset connector. (See figure FO-3.) Repair or replace wiring as applicable.
4. No received audio at the other three stations; no sidetone at transmitting station. Rotary selector switch in ICS position and ICS control panel properly keyed.	*a.* Defective headset microphone.	*a.* Try same headset at another station; if good, refer to next probable cause. Replace headset if result is the same at another station.
	b. Defective microphone audio amplifier or transmit relay in ICS control panel.	*b.* Temporarily replace suspected ICS control panel with one from another station and try audio transmission again. If same results occur, refer to next appropriate probable cause. Replace suspected ICS control panel if audio transmission is good using another ICS control panel.

Symptom	Probable cause	Corrective measures
	c. Defective trigger switch (detent 1) on cyclic control(pilot's or copilot's station only).	*c.* Try detent 2 of trigger switch. If same result, refer to next probable cause. Replace defective trigger switch if audio transmission occurs using alternate keying method. If replacing trigger switch does not correct the malfunction, refer to last probable cause of this symptom.
	d. Defective trigger switch (detent 2) on cyclic control (pilot's or copilot's station only).	*d.* Try foot switch. If results are the same, refer to last probable cause of this symptom. Replace defective trigger switch if audio transmission occurs using alternate keying method.
	e. Defective foot switch.	*e.* Try trigger switch, detent 2, (pilot's or copilot's station only) or hand-operated push-to-talk switch (right or left crewmember's station only). If same result, refer to last probable cause of this symptom. Replace defective foot switch if audio transmission occurs using alternate keying method.
	f. Defective hand-operated push-to-talk switch (right or left crewmember's station only).	*f.* Try foot switch. If results are the same, refer to next probable cause. Replace defective hand-operated push-to-talk switch or total (headset as appropriate) if audio transmission occurs using alternate keying method.
	g. Open ground circuit of keying switches.	*g.* Make continuity checks of keying ground circuit through keying switches to ICS control panel. (See figure

Symptom	Probable cause	Corrective measures
		FO-3). Repair or replace defective wiring as applicable.
5. No audio reception nor transmission at one of the four stations. Sidetone heard during transmission attempt. Rotary selector switch in ICS position.	Open interphone audio line.	Make continuity check of interphone audio line between ICS control panel and common tie point TB20 terminal 14 or TB70 Section 2 terminals F, G, and H as applicable. (See figure FO-3.) Repair or replace wiring as applicable.
6. No audio transmission nor sidetone from one of the four stations when HOT MIKE switch is positioned to HOT MIKE and the ICS control panel is not keyed by an alternate method.	Defective HOT MIKE switch on ICS control panel.	Replace defective ICS control panel.
7. Sidetone heard at transmitting station; interphone (ICS) audio received at other stations; transmitting ICS control panel rotary selector switch in any or one of the radio facility positions and the ICS panel keyed (other than detent 1 on pilot's or copilot's cyclic control trigger switch).	Defective transmit relay or short circuit in transmitting ICS control panel.	Replace defective ICS control panel.
8. Received audio at other stations and sidetone at transmitting station is slurred, noisy, or otherwise unclear.	Defective microphone audio amplifier in transmitting ICS control panel.	Replace defective ICS control panel.
9. Received audio slurred, noisy, or otherwise unclear at one of the four stations.	Defective headset amplifier in ICS control panel.	Replace defective ICS control panel.

3–7. Troubleshooting Radio Set AN/ARC-51BX UHF Command Facility

a. Facility Performance Test. The interphone facility's uhf radio transmission and reception performance test is made in conjunction with the ARC-51BX facility performance test.

(1) Ensure the UHF ARC-51, INTER COM PLT & CREW-R, and INTER COM CPLT & CREW-L circuit breakers are depressed and engaged.

(2) Position controls on uhf control panel as follows and allow 1-minute warmup time.

Mode selector	MAN
Volume control	Midposition
SQ DISABLE switch	OFF
Function switch	T/R

(3) Position controls on each ICS control panel as follows:

No. 2 mixing switch	ON (up)
All other mixing switches	OFF (down)
Rotary selector switch	ICS
VOL control	As desired

(4) Using the frequency selector controls on the uhf control panel, manually select a frequency known to be active and within reception range of the radio set.

(5) At each interphone station listen for received audio signals. Audio signals should be clear, distinct, and of adequate volume.

(6) On the uhf control panel, adjust the VOL control cw and ccw while listening to received audio. The volume level heard should increase and decrease respectively.

(7) Adjust VOL control for a comfortable level of reception.

(8) Using the frequency selector controls, manually select several frequencies throughout the frequency range of the radio set, generally listed on frequency card, known to be active and within reception range of the radio set. Received audio should be heard at each active channel frequency and an 800 Hz audio tone should be heard during channel-changing.

(9) Select a frequency channel that is inactive.

(10) Position the SW DISABLE switch to ON. Receiver background noise should be heard in the headsets.

(11) Position the SQ DISABLE switch to OFF. Receiver background noise should stop.

(12) Select a frequency channel approximately midrange in the radio set's frequency range capability that is active.

NOTE

Do not select 243.00 MC frequency for transmission. This frequency is reserved for distress or other emergencies.

(13) At the pilot's station, position the ICS control panel rotary selector switch to 2 and the No. 2 mixing switch to OFF (down), key the radio set for transmission, and establish communications. Sidetone, transmitted audio, and received audio should be heard clear, distinct, and of adequate volume at all interphone stations and at the other radio station with which communications has been established.

(14) While the radio set is keyed, observe the RF wattmeter indication on the receiver-transmitter. The power output should indicate at least 20 watts.

(15) Also while the radio set is keyed, press the PRESS FOR REFL POWER switch on the receiver-transmitter and observe the RF wattmeter indication. The indication of reflected power should be less than 5 watts.

(16) Repeat substep (13) at the copilot's, right crewmember's, and left crewmember's stations.

(17) Select a frequency channel near the lower end of the frequency band that is active, establish communications, and repeat substeps (14) and (15).

(18) Select a frequency channel near the upper end of the frequency band that is active, establish communications, and repeat substeps (14) and (15).

(19) Position the mode selector switch to PRESET CHAN and select the preset channels 1 through 20 one at a time using the preset channel control. Audio reception should be available on each channel that is within reception range of the radio set. (Frequency of preset channels is listed on the frequency card.)

(20) Position the mode selector switch to MAN, the function selector switch to T/R + G, the frequency controls to a local station (such as the control tower) frequency.

(21) Establish communications with local station and request a test transmission from the local station on the guard frequency channel (243.00 MHz) and an establishment of communications on the guard frequency channel.

NOTE

The following two substeps should be performed as quickly as possible to limit transmission time on the guard channel frequency.

(22) During test transmission on guard frequency channel from local station, perform the following steps:

(a) Listen to the received audio. The received audio should include any activity on the manually selected frequency and the test audio on the guard channel. Both audio signals should be clear and distinct.

(b) Position function selector switch to T/R. Guard channel test audio signal should stop.

(23) Manually select another frequency other than the guard channel, position the mode selector switch to GD XMIT, and establish communications with the local station. Received audio at local station should be clear and distinct. Only the guard channel received audio should be heard in the headsets.

(24) Discontinue communications.

(25) On each ICS control panel, position the rotary selector switch to ICS and the No. 2 mixer switch to OFF (down).

(26) On the uhf control panel, position the mode selector switch to MAN and the function selector switch to OFF.

b. Radio Set AN/ARC-51BX UHF Command Facility Troubleshooting Chart.

Symptom	Probable cause	Corrective measures
1. No received audio heard at any interphone station.	*a.* Defective UHF ARC-51BX circuit breaker.	*a.* Replace defective circuit breaker.
	b. Defective function selector switch or VOL control on uhf control panel.	*b.* Replace defective uhf control panel.
	c. Defective uhf receiver-transmitter.	*c.* Replace defective uhf receiver-transmitter.
	d. Open wiring or short to ground in impedance matching network.	*d.* Check impedance matching network for continuity between J600 pin 24 and pin b for ohms resistance between J600 pin b and pin 28. If continuity and resistance checks are good, refer to next probable cause. If the continuity or resistance check is not as stated, replace defective impedance matching network.
	e. Open circuit between P1403 pin R and P3801 pin E, between P3801 pin F and J600 pin 24, or between J600 pin b and TB20 terminal 3.	*e.* Make continuity checks of received audio line. (See figure FO-4 and FO-3.) Repair or replace wiring as applicable.
2. No received audio heard at one interphone station. No. 2 mixer switch in ON (up) position. Rotary selector switch in ICS position.	*a.* Defective mixer switch on ICS control panel.	*a.* Replace defective ICS control panel.
	b. Defective headset.	*b.* Refer to interphone facility troubleshooting paragraph 3-6.

Symptom	Probable cause	Corrective measures
	c. Open receiver audio line between pin SS on ICS control panel connector and common tie point TB20 terminal 3 or J830 section 5 terminals A or B as applicable.	*c.* Make continuity check of uhf receiver audio line. (See figure FO-3.) Repair or replace wiring as applicable.
3. Received audio heard is either too loud or not heard when VOL control on uhf control panel is adjusted.	Defective volume control on uhf control panel.	Replace defective uhf control panel.
4. 800 Hz tone not heard during channel changing.	*a.* Defective frequency selector controls on uhf control panel.	*a.* Replace defective uhf control panel.
	b. Defective channel changing circuits in uhf receiver-transmitter.	*b.* Replace defective uhf receiver-transmitter.
	c. Open frequency control wiring between uhf control panel and uhf receiver-transmitter.	*c.* Make continuity checks of frequency control wires between P3801 and P1401. (See figure FO-4.) Repair or replace wiring as applicable.
5. Receiver background noise not heard when SQ DISABLE switch is positioned to ON, or no change noted in receiver noise whether the SQ DISABLE switch is in the ON or OFF positions.	*a.* Defective SQ DISABLE switch on uhf control panel.	*a.* Replace defective uhf control panel.
	b. Defective or maladjusted squelch circuits in the uhf receiver-transmitter.	*b.* Replace defective uhf receiver-transmitter.
	c. Open circuit between uhf control panel P3801 pin H and uhf receiver-transmitter P1403 pin a.	*c.* Make continuity check of squelch circuit wiring between uhf control panel and receiver-transmitter. (See figure FO-4.) Repair or replace wiring as applicable.
6. No sidetone heard during transmission from any interphone station. Received audio and transmitted audio good.	Defective sidetone amplifier in uhf receiver-transmitter.	Replace defective uhf receiver-transmitter.
7. No sidetone or received audio heard at one interphone station. Transmitted audio good.	*a.* Defective rotary selector switch on ICS control panel.	*a.* Replace defective ICS control panel.
	b. Defective headset.	*b.* Refer to interphone

Symptom	Probable cause	Corrective measures
		facility troubleshooting paragraph 3-6.
	c. Open circuit between ICS control panel connector pin SS and TB20 terminal 3 or TB70 section 5 terminals A or B as applicable.	c. Make continuity check of uhf received audio circuits. (See figure FO-3.) Repair or replace wiring as applicable.
8. Cannot establish communications with another radio station. No sidetone heard at any interphone station. Received audio good. RF wattmeter indicates transmit power good and reflected power good.	a. Defective audio threshold detector. b. Defective transmit circuits in uhf receiver-transmitter. c. Open circuit in uhf transmit audio line from TB20 terminals 1 and 2 to P3303 pins Y and E, or from P3303 pins A and U to P1403 pins V and E.	a. Replace audio threshold detector (Z20). b. Replace defective uhf receiver-transmitter. c. Make continuity checks of uhf transmit audio circuit. (See figure FO-4.) Repair or replace wiring as applicable.
9. Cannot establish communications with another radio station. Sidetone and received audio good at all interphone stations. RF wattmeter indicates no transmit nor reflected power.	Defective transmit-receive relay in uhf receiver-transmitter.	Replace defective uhf receiver-transmitter.
10. Cannot establish communications with another radio station. Sidetone good. Received audio weak or none. RF wattmeter indicates good transmit power but excessive reflected power.	a. Defective antenna cable, loose connector, damaged, etc. b. Defective uhf antenna.	a. Make visual examination of cable for defects and check connectors at antenna and uhf receiver-transmitter. Replace antenna cable if defective. b. Replace defective uhf antenna.
11. Cannot establish communications with another radio station from one interphone station. No sidetone. Received audio good. RF wattmeter indicates no transmit or reflected power during transmission attempt from malfunctioning interphone station.	a. Defective rotary selector switch on ICS control panel. b. Defective diode in audio threshold detector. c. Open uhf transmit control line between ICS control panel connector pin T and audio threshold detector P3304 pin J, X, N, or b as applicable.	a. Replace defective ICS control panel. b. Replace defective threshold detector. c. Make continuity check of uhf transmit control line. (See figure FO-3.) Repair or replace wiring as applicable.
12. Cannot establish communications with another radio station. No	a. Defective relay in uhf receiver-transmitter.	a. Replace defective uhf receiver-transmitter.

Symptom	Probable cause	Corrective measures
sidetone but good received audio at all interphone stations. RF wattmeter indicates no transmit nor reflected power.	*b.* Open transmit control line between audio threshold detector P3303 pin F and uhf receiver-transmitter P1403 pin P.	*b.* Make continuity check of uhf transmit control line. (See figure FO-3 and FO-4.) Repair or replace wiring as applicable.
13. Cannot establish communications with one or more radio stations known to be active. Communications can be established on other frequency channels. No received audio at any interphone station for specific frequency channel(s). Sidetone good. RF wattmeter indications normal.		Try to determine which frequency control (0.05 MC, 1 MC, or 10 MC control) is causing the malfunction by selecting other channels with similar frequency number arrangement. Note this information on applicable forms for equipment replaced in following Corrective Measures.
	a. Defective frequency selector controls on uhf control panel.	*a.* Replace defective uhf control panel.
	b. Defective frequency crystals or channel changing circuits in the uhf receiver-transmitter.	*b.* Replace defective uhf receiver-transmitter.
	c. Open frequency control wiring between uhf control panel and receiver-transmitter.	*c.* Make continuity checks of frequency control wiring between P3801 and P1401. (See figure FO-4.) Repair or replace wiring as applicable.
14. RF wattmeter indication consistently high or low or no indication at all. Transmission and reception otherwise normal and good.	Defective rf wattmeter or associated circuits in uhf receiver-transmitter.	Replace defective uhf receiver-transmitter.
15. RF wattmeter indicates low transmit power on channels within a small portion of the frequency range. Normal indications on the remaining portion of the frequency range.	Alignment and tuning of transmitter final stage in uhf receiver-transmitter.	Replace uhf receiver-transmitter.
16. Preset channel selection inoperative.	Defective PRESET CHAN control or circuit in uhf control panel.	Replace defective uhf control panel.

Symptom	Probable cause	Corrective measures
17. Specific preset channel(s) inoperative. Similar symptom apparent during manual frequency selection.	*a.* Defective preset channel control circuit in uhf control panel. *b.* Defective channel changing circuits in uhf receiver-transmitter. *c.* Open frequency control wiring between uhf control panel and receiver-transmitter.	*a.* Replace defective uhf control panel. *b.* Replace defective uhf receiver-transmitter. *c.* Make continuity checks of frequency control wires between P3801 and P1401. (See figure FO-4.) Repair or replace wiring as applicable.
18. Guard channel received audio distorted or noisy.	Defective guard channel receiver in uhf receiver-transmitter.	Replace defective uhf receiver-transmitter.
19. Guard channel audio being received when function selector switch on uhf control panel is positioned to T/R.	Defective function selector switch on uhf control panel.	Replace defective uhf control panel.
20. Communications cannot be established on guard channel. Sidetone heard in headsets.	*a.* Defective mode selector switch or frequency selection circuit in uhf control panel. *b.* Defective channel changing circuits in uhf receiver-transmitter. *c.* Open frequency control wiring between uhf control panel and uhf receiver-transmitter.	*a.* Replace defective uhf control panel. *b.* Replace defective uhf receiver-transmitter. *c.* Make continuity check of frequency control wiring between P3801 and P1401. (See figure FO-4.) Repair or replace wiring as required.

3–8. Troubleshooting Radio Set AN/ARC-115 Facility

a. Facility Performance Test. The interphone facility's vhf-am radio transmission and reception performance test is made in conjunction with the ARC-115 facility performance test.

(1) Ensure the VHF XCVR COMM, INTER COM PLT & CREW-R, and INTER COM CPLT & CREW-L circuit breakers are depressed and engaged.

(2) On each ICS control panel, position the controls as follows:

Rotary selector switch	ICS
No. 3 mixer switch	ON (up)
All other mixer switches	OFF (down)
VOL control	Midrange

(3) On the vhf-am receiver-transmitter, position the controls as follows and allow at least a 5-minute warmup time.

Function selector switch	T/R
AUDIO control	As desired
Frequency controls	116.050 MEGA-CYCLES

(4) Depress and hold the RCVR TEST pushbutton switch on the vhf-am receiver-transmitter and listen for an 800 Hz tone in the headset at each interphone station. Verify that receiver background noise is cut out and a clear distinct tone is heard.

(5) Release the RCVR TEST pushbutton switch.

(6) Reset the frequency controls for 123.500, 132.500, 138.050, and 148.800 MEGA-CYCLES (one frequency setting at a time) and repeat previous substeps (4) and (5) at one of the interphone stations.

(7) Reset the frequency controls to an active authorized frequency in the lower portion of the vhf-am radio set frequency range.

(8) Rotate the AUDIO control cw and ccw. Received audio volume level heard in the headsets should increase and decrease, respectively, and the received audio should be clear and distinct. Set the AUDIO control for comfortable volume level as heard in the headsets.

(9) On each ICS control panel, position the No. 3 mixer switch to OFF (down). Received audio should not be heard at any interphone station.

(10) On each ICS control panel, position the rotary selector switch to 3. Received audio should be heard at each interphone station.

(11) At the pilot's station, key the vhf-am radio set for transmission and establish communications with the local station. Sidetone should be clear, distinct, and of adequate volume. Received audio at the local station should be clear, distinct, and of adequate volume.

(12) Repeat previous substep (11) at the copilot's, right crewmember's, and left crewmember's stations.

(13) Reset the frequency controls on the vhf-am receiver-transmitter to an active authorized frequency in the middle portion of the vhf-am radio set frequency range and repeat previous substep (11).

(14) Reset the frequency controls on the vhf-am receiver-transmitter to an active authorized frequency in the upper portion of the vhf-am radio set frequency range and repeat previous substep (11).

(15) Position the function selector on the vhf-am receiver-transmitter switch to T/R GUARD.

(16) Establish communications with a local station, such as the control tower, and request a test transmission on the vhf guard channel frequency (121.500 MHz) from the local station.

NOTE

Perform the following three steps as quickly as possible to limit transmission time on the vhf-am guard channel frequency.

(17) Listen for the test transmission on the vhf-am guard channel. Received audio on the guard channel should be clear, distinct, and of adequate volume.

(18) On the vhf-am receiver-transmitter, position the function selector switch to T/R. Guard channel audio should not be heard.

(19) Reset the frequency controls for 121.500 MEGACYCLES. Received audio on guard channel frequency should be heard clear, distinct, and of adequate volume.

(20) On the vhf-am receiver-transmitter, reset the frequency controls for the local station frequency and position the function selector switch to OFF.

(21) On each ICS control panel, position the rotary selector switch to ICS.

b. Radio Set AN/ARC-115 Facility Troubleshooting Chart.

Symptom	Probable cause	Corrective measures
1. No tone, received audio, or sidetone at any interphone station.	*a.* Defective vhf-am receiver-transmitter.	*a.* Remove vhf-am receiver-transmitter, reset circuit breaker and measure for +28 vdc at P3201 pin D to chassis ground.
	b. Defective VHF XCVR COMM circuit breaker (CB32).	*b.* If +28 vdc is present at P3201 pin D, replace defective vhf-am receiver-transmitter. If +28 vdc not present at P3201 pin D, replace defective circuit breaker.
	c. Open primary power or ground circuit.	*c.* Make continuity checks of primary power and ground lines to the vhf-am receiver-transmitter. (See figure FO-5.) Repair or replace wiring as applicable.
	d. Defective impedance matching network (A16).	*d.* Make continuity check between pins 27 and e and resistance check between pins 27 and 28 on board. If open exists between pins 27 and e or short exists between pins 27 and 28, replace defective impedance matching network (A16).
	e. Open receiver audio line between vhf-am receiver-transmitter P3201 pin d, impedance matching network (A16) J600 pins e and 27, and TB20 terminal 10.	*e.* Make continuity check of receiver audio line. (See figures FO-5 and FO-3.) Repair or replace wiring as applicable.
2. No tone or received audio heard at one of the interphone stations.	*a.* Defective No. 3 mixer switch on applicable ICS control panel.	*a.* Replace defective ICS control panel.
	b. Defective headset, receiver audio amplifier in ICS control panel, or open wiring between headset and ICS control panel.	*b.* Refer to interphone facility troubleshooting, paragraph 3-6.

Symptom	Probable cause	Corrective measures
	c. Open wiring between ICS control panel connector pin PP and TB20 terminal 10 or TB70 section 5 terminals D or E as applicable.	*c.* Make continuity check of vhf-am receiver audio line. (See figure FO-3.) Repair or replace wiring as applicable.
3. Receiver background noise is not squelched.	Defective or maladjusted squelch circuits in vhf-am receiver-transmitter.	Replace defective vhf-am receiver-transmitter.
4. Receiver audio not adjustable with the AUDIO control.	Defective AUDIO control in vhf-am receiver-transmitter.	Replace defective vhf-am receiver-transmitter.
5. Receiver audio still heard in headset at one of the ICS control panels when the No. 3 mixer switch is positioned to OFF and rotary selector switch is in the ICS position.	Defective No. 3 mixer switch in ICS control panel.	Replace defective ICS control panel.
6. Receiver audio is not heard in headset at one of the ICS control panels when rotary selector switch is positioned to 3.	Defective rotary selector switch on ICS control panel.	Replace defective ICS control panel.
7. Sidetone or received audio is not clear, distinct, or of adequate volume at any interphone station.	Defective or misaligned receiver section in vhf-am receiver-transmitter.	Replace defective vhf-am receiver-transmitter.
8. Sidetone or received audio is not clear, distinct, or of adequate volume at one of the interphone stations.	Defective transmit or receiver audio amplifier in ICS control panel.	Refer to interphone facility trouble-shooting, paragraph 3-6.
9. Received audio at local station is not clear or distinct when using any of the interphone stations.	*a.* Defective or misaligned transmitter section of vhf-am receiver-transmitter. *b.* Defective diode in audio threshold detector (Z20).	*a.* Replace defective vhf-am receiver-transmitter. *b.* Replace defective audio threshold detector (Z20).
10. Received audio at local station is not clear or distinct when using one of the interphone stations.	Defective transmit audio amplifier in ICS control panel.	Refer to interphone facility trouble-shooting, paragraph 3-6.

Symptom	Probable cause	Corrective measures
11. No sidetone heard; communications can be established with local station.	Defective sidetone circuits in vhf-am receiver-transmitter.	Replace defective vhf-am receiver-transmitter.
12. Cannot establish communications with local station(s) or received aud o at local station(s) is weak; sidetone volume level may be weak.	*a.* Loose connections or damaged rf cables between vhf-am receiver-transmitter and vhf rf filter or vhf rf filter and antenna.	*a.* Tighten loose connections and replace damaged rf cables; try communications check again. If malfunction is not corrected, refer to next probable cause.
	b. Defective power amplifier stage or amplitude modulation stage of vhf-am receiver-transmitter.	*b.* Insert wattmeter with 25-250 MHz element between antenna connector on vhf-am receiver-transmitter and rf cable connector P3200, and key radio set for transmission. Monitor transmitted and reflected power; transmitted power should be not less than 9 watts and reflected power should not exceed 0.25 times the transmitted power. If transmitted power is less than 9 watts or both the transmitted and reflected power good, replace defective vhf-am receiver-transmitter. If reflected power is too high, refer to next probable cause. NOTE If transmitted power and reflected power are good, speak steadily into the microphone at the interphone station being keyed and note the transmitted power indication. If the transmitted power remains nearly constant then poor amplitude modulation of vhf signal is occurring.

Symptom	Probable cause	Corrective measures
		Transmit power should nearly decrease by 50 percent at 100 percent modulation of a constant audio input.
	c. Defective rf cable between vhf-am receiver-transmitter and vhf rf filter (FL 6).	*c.* Insert wattmeter between vhf rf filter (FL 6) input and rf cable connector P3202; test the transmit and reflected power again. If transmit power is too low, replace defective rf cable. If reflected power is too high, refer to next probable cause.
	d. Defective vhf rf filter (FL 6).	*d.* Insert wattmeter between vhf rf filter (FL 6) output and rf cable connector P3203; test the transmit and reflected power again. If transmit power is too low, replace defective vhf rf filter (FL 6). If reflected power is too high, refer to next probable cause.
	e. Defective rf cable between vhf rf filter (FL 6) and antenna.	*e.* Insert wattmeter between antenna and rf cable connector P1906; test the transmit and reflected power again. If transmit power is too low, replace rf cable.
	f. Defective antenna (AT-1108/ARC).	*f.* If reflected power is too high in previous test, replace defective antenna.
13. Cannot establish communications with any local stations. No sidetone heard in headset at any interphone station. Received audio normal.	*a.* Defective transmitter section or transmit/receiver relay in vhf-am receiver-transmitter.	*a.* Replace defective vhf-am receiver-transmitter.
	b. Defective audio transformer in audio threshold detector (Z20).	*b.* Replace defective audio threshold detector (Z20).

Symptom	Probable cause	Corrective measures
	c. Open transmit audio line from TB20 terminal 5 to audio threshold detector P3303 pin C or from P3303 pin G to vhf-am receiver-transmitter P3301 pin K.	c. Make continuity check of transmit audio line. (See figures FO-5 and FO-3.) Repair or replace wiring as applicable.
	d. Open transmit control line from audio threshold detector (Z20) P3304 pin G to vhf-am receiver-transmitter P3302 pin h.	d. Make continuity check of transmit control line. (See figures FO-5 and FO-3.) Repair or replace wiring as applicable.
14. Cannot establish communications with any local stations from one of the interphone stations. No sidetone heard in the headset. Received audio normal.	a. Defective rotary selector switch or transmit relay in ICS control panel.	a. Replace defective ICS control panel.
	b. Defective diode in audio threshold detector (Z20).	b. Replace defective audio threshold detector (Z20).
	c. Open transmit audio line from pin L on ICS control panel connector to TB20 terminal 5 or TB70 section 1 terminal F or G as applicable.	c. Make continuity check of transmit audio line. (See figure FO-3.) Repair or replace wiring as applicable.
	d. Open transmit control line from pin N on ICS control panel connector to audio threshold detector P3304 pin R, Y, M, or c (pilot, copilot, right and left crewmember, respectively) as applicable.	d. Make continuity check of transmit control line. (See figure FO-3.) Repair or replace wiring as applicable.
15. No received audio on guard channel. Function selector switch on vhf-am receiver-transmitter in T/R GUARD position and authorize local station frequency selected.	Defective guard channel receiver or function selector switch in vhf-am receiver-transmitter.	Replace defective vhf-am receiver-transmitter.
16. Received audio on guard channel still heard in headsets when function selector switch on vhf-am receiver-transmitter is positioned to T/R and authorized local station frequency selected.	Defective function selector switch on vhf-am receiver-transmitter.	Replace defective vhf-am receiver-transmitter.

Symptom	Probable cause	Corrective measures
17. No received audio on guard channel. Function selector switch on vhf-am receiver-transmitter is in T/R position but guard channel frequency (121.500 MHz) selected.	Defective frequency selection circuits of main receiver in vhf-	Replace defective vhf-am receiver-transmitter.

3–9. Troubleshooting Radio Set AN/ARC-54 or AN/ARC-131 No. 1 FM Liaison Facility

a. Facility Performance Test. The interphone facility's No. 1 fm liaison radio transmission and reception performance test is made in conjunction with the No. 1 fm liaison facility's performance test.

(1) Ensure the FM ARC-54, INTER COM PLT & CREW-R, and INTER COM CPLT & CREW-L circuit breakers are depressed and engaged.

(2) On each ICS control panel, position the controls as follows:

Rotary selector switch	ICS
No. 1 mixer switch	ON (up)
All other mixer switches	OFF (down)
VOL control	Midrange

(3) On the No. 1 fm liaison control panel, position the controls as follows and allow at least a 1-minute warmup time.

Mode selector switch	PTT (T/R for ARC-131)
VOL control	Midrange (comfortable level)
SQUELCH switch	CARR

Blower in No. 1 fm liaison receiver-transmitter should be operating.

(4) With the frequency selector controls on the No. 1 fm liaison control panel, select several frequencies throughout the radio set's frequency range that are known to be active. Received audio should be heard clear, distinct, and of adequate volume at each interphone station. Volume level of strong stations (generally within the local area) should remain at a comfortable level. An 800 Hz tone should be heard during channel changing.

(5) On the No. 1 fm liaison control panel, select an inactive frequency of approximately 30.00 MHz and position the SQUELCH switch to DIS. A hiss (receiver noise) should be heard in the headsets.

(6) Position the SQUELCH switch to CARR. A sharp reduction in the hiss level should be noted.

(7) Select several other frequencies (active or inactive) throughout the radio set's frequency range and note receiver noise level when no audio signal is present. Receiver noise should be squelch when audio signals are not present throughout the frequency range of the radio set.

(8) Select a frequency of a local station (such as the control tower).

(9) On each ICS control panel, position the No. 1 mixer switch to off. Receiver audio should not be heard.

(10) Position the rotary selector switch on each ICS control panel to 1. Receiver audio should be heard in the headsets at each interphone station.

(11) At each interphone station, key the radio set and establish communications with the local station. Received audio at local station should be clear, distinct, and of adequate volume. Sidetone should be heard in the headset and should be clear, distinct, and of adequate volume.

(12) Request establishment of communications using tone modulation.

(13) On the No. 1 fm liaison control panel, position the SQUELCH switch to TONE and establish communications with the local station. Received audio at local station should be clear, distinct, and of adequate volume. Received audio and sidetone heard in the headsets should be clear, distinct, and of adequate volume.

(14) While local station is transmitting using tone modulation, momentarily position the SQUELCH switch to CARR. Received audio from tone modulated signal should stop when SQUELCH switch is in the CARR position.

(15) On the No. 1 fm liaison control panel, position the mode selector switch to HOME, SQUELCH switch to CARR, and select a frequency of a local station that is in a general direction of left or right in relationship to the nose of the helicopter. Homing signals should be heard in the headsets and on the ID-1347/ARN-82 course selector indicator, the vertical pointer should deflect toward the local station, both the vertical and horizontal flags should remain out of sight, and the horizontal pointer will normally indicate over-the-station position.

NOTE

The amount and direction of deflection of the pointers and position of flags are dependent upon signal strength received and direction of station. Displacement accuracy of the pointers cannot be determined on the ground; therefore only the fact of displacement in the general direction is to be noted.

NOTE

The RETRAN mode is not normally checked while on the ground. If requirements exist that this mode be checked in conjunction with the AN/ARC-114 No. 2 fm liaison facility, two local stations are required operating at least 2 MHz apart. The No. 1 fm liaison facility should be checked using both the CARR and TONE functions of the SQUELCH switch.

(16) On the No. 1 fm liaison control panel, position the mode selector switch to OFF.

(17) On each ICS control panel, position the rotary selector switch to ICS.

b. Radio Set AN/ARC-54 or AN/ARC-131 No. 1 FM Liaison Facility Troubleshooting Chart.

Symptom	Probable cause	Corrective measures
1. No received audio at any interphone station. Blower in receiver-transmitter does not operate.	*a.* Defective FM ARC-54 circuit breaker (CB31).	*a.* Check for +28 vdc at TB19 terminal 5. (See figure FO-6.) If +28 vdc is not present, replace defective circuit breaker.
	b. Defective mode selector switch on fm control panel.	*b.* Check for +28 vdc at input terminal of radio noise filter, (FL 1). (See figure FO-6.) If +28 vdc is not present, replace fm control panel.
	c. Defective radio noise filter (FL 1).	*c.* Check for +28 vdc at output terminal of radio noise filter. (See figure FO-6.) If +28 vdc is not present, replace radio noise filter (FL 1).

Symptom	Probable cause	Corrective measures
	d. Defective fm receiver-transmitter.	*d.* If +28 vdc is present at output of radio noise filter (FL 1), replace defective fm receiver-transmitter.
	e. Open wiring in primary power line.	*e.* If +28 vdc is not present and replacing appropriate unit did not correct the malfunction, make continuity checks of primary power circuit. (See figure FO-6.) Repair or replace wiring as applicable.
2. No received audio at any interphone station. Blower in receiver-transmitter operating.	*a.* Defective receiver section of fm receiver-transmitter.	*a.* Replace defective fm receiver-transmitter.
	b. Defective mode selector switch on fm control panel.	*b.* Replace defective fm control panel.
	c. Open receiver audio circuit between receiver-transmitter P2106 pin 13 and fm control panel P2107 pin JJ or between fm control panel P2107 pin N and audio threshold detector (Z20) P3304 pin A.	*c.* Make continuity check of receiver audio circuit. (See figure FO-6.) Repair or replace wiring as applicable.
3. Received audio is garbled, noisy, or distorted at all interphone stations.	Defective receiver amplifier in fm receiver-transmitter.	Replace defective fm receiver-transmitter.
4. An 800 Hz channel changing tone is not heard at any interphone station when changing frequency selection on the fm control panel. Receiver-transmitter changes frequency.	Defective 800 Hz tone generator, audio gate, or anti-transmit relay in fm receiver-transmitter.	Replace defective fm receiver-transmitter.
5. Audio level of strong stations are extra loud while the audio level of weaker stations is comfortable.	Defective automatic gain control circuit in fm receiver-transmitter.	Replace defective fm receiver-transmitter.
6. Receiver noise is not squelched when audio signal	*a.* SQ ADJ control on fm receiver-transmitter	*a.* Adjust SQ ADJ control (located on

Symptom	Probable cause	Corrective measures
is not present SQUELCH switch on fm control panel is positioned to CARR.	improperly adjusted.	receiver-transmitter front panel) as follows: (1) Disconnect coaxial cable connector P3301 from fm antenna. (2) On fm control panel, ensure the mode selector is positioned to PTT (T/R for ARC-131) and SQUELCH switch is positioned to CARR. (3) On receiver-transmitter, set SQ ADJ full ccw. (4) On fm control panel, adjust VOL control to comfortable level of receiver background noise (hiss) as heard in the headsets. (5) Rotate SQ ADJ control cw until background noise just cuts out. Do not rotate control beyond this point. (6) Check squelch setting at several selected frequencies. If all frequencies selected are not fully squelched, rotate SQ ADJ cw slightly to squelch the frequencies not fully squelched. (7) Reconnect coaxial cable connector P3301 to fm antenna.
	b. Defective squelch circuits in fm receiver-transmitter.	*b.* If the squelch circuits cannot be adjusted as described above, replace the

Symptom	Probable cause	Corrective measures
		fm receiver-transmitter.
	c. Defective SQUELCH switch on fm control panel.	*c.* If replacing the receiver-transmitter did not correct the malfunction, replace the fm control panel.
	d. Open wiring in squelch circuit between fm control panel P2107 and receiver-transmitter P2106.	*d.* If the above procedures did not correct the malfunction, make continuity checks of the squelch lines. (See figure FO-6.) Repair or replace wiring as applicable.
7. Receiver audio is still heard at one of the interphone stations when the No. 1 mixer switch is positioned to OFF (down). Rotary selector switch is positioned to ICS.	Defective mixer switch on ICS control panel.	Replace defective ICS control panel.
8. Receiver audio not heard at one of the interphone stations when rotary selector switch is positioned to 1. Mixer switch No. 1 is OFF (down). Normal reception of receiver audio using mixer switch No. 1.	Defective rotary selector switch on ICS control panel.	Replace defective ICS control panel.
9. Cannot establish communications with any local station from one of the interphone stations. No received audio nor sidetone heard. Sidetone of malfunctioning interphone station not heard at any other interphone station.	*a.* Defective microphone, transmit audio amplifier in ICS control panel, or wiring between microphone and ICS control panel.	*a.* Refer to interphone facility troubleshooting, paragraph 3-6.
	b. Defective rotary selector switch or transmit relay in ICS control panel.	*b.* Replace defective ICS control panel.
	c. Open transmit control line between ICS control panel connector pin X and TB19 terminal 4 or TB70 section 3 terminals A or B as applicable.	*c.* Make continuity check of transmit control line. (See figure FO-3.) Repair or replace wiring as applicable.
10. Cannot establish communications with any local sta-	*a.* Defective receiver amplifier in ICS con-	*a.* Refer to interphone facility trouble-

Symptom	Probable cause	Corrective measures
tion from one of the interphone stations. Neither received audio nor sidetone is heard. Received audio and sidetone normal at other interphone stations. Sidetone of malfunctioning interphone station is heard at the other interphone stations.	trol panel, defective headset, or open wire between headset and ICS control panel.	shooting, paragraph 3-6.
	b. Defective relay in audio threshold detector (Z20).	*b.* Disconnect connector P3304 on audio threshold detector (Z20) and make continuity check between pin A and pin f (pilot), pin T (copilot), pin V (right crewmember), or pin U (left crewmember), as appropriate on the audio threshold detector. If open exists, replace defective audio threshold detector.
	c. Open receiver audio line between audio threshold detector P3304 pin f, T, V, or U as applicable and ICS control panel connector pin KK.	*c.* Make continuity check of receiver audio line. (See figure FO-3.) Repair or replace wiring as applicable.
11. Cannot establish communications with certain local stations known to be active.	*a.* Defective frequency selector controls on fm control panel.	*a.* Replace defective fm control panel.
	b. Defective frequency changing circuits in fm receiver-transmitter.	*b.* Replace defective fm receiver-transmitter.
	c. Open frequency selection wiring between fm control panel P2107 and fm receiver-transmitter P2106.	*c.* If replacing the fm control panel and receiver-transmitter did not correct the malfunction, make continuity checks of the frequency selection wiring. (See figure FO-6.) Repair or replace wiring as applicable.
12. Cannot establish communications with any interphone station. Received audio normal. No sidetone.	*a.* Defective mode selector switch on fm control panel.	*a.* Replace defective fm control panel.
	b. Defective transmitter audio amplifier or transmit relay in fm receiver-transmitter.	*b.* Replace defective fm receiver-transmitter.

Symptom	Probable cause	Corrective measures
	c. Open transmit audio circuit between TB20 terminal 4 and fm control panel P2107 pin y or between fm control panel P2107 pin x and fm receiver-transmitter P2106 pin 6.	*c.* If replacing the fm control panel and receiver-transmitter did not correct the malfunction, make continuity checks of the transmit audio circuit. (See figure FO-6.) Repair or replace defective wiring as applicable.
	d. Open transmit control line between TB19 terminal 4 and fm control panel P2107 pin q or between fm control panel P2107 pin r and fm receiver-transmitter P2106 pins 41 and 42.	*d.* If continuity check of the transmit audio circuit is good, make continuity checks of the transmit control line. (See figure FO-6.) Repair or replace defective wiring as applicable.
13. Cannot establish communications with any local station when the SQUELCH switch on the fm control panel is positioned to TONE.	*a.* Defective tone modulator circuit in fm receiver-transmitter.	*a.* Replace defective fm receiver-transmitter.
	b. Defective SQUELCH switch on fm control panel.	*b.* Replace defective fm control panel.
	c. Open tone transmit control line between fm control panel P2107 pin X and fm receiver-transmitter P2106 pin 9.	*c.* Make continuity check of tone transmit control line. (See figure FO-6.) Repair or replace wire as applicable.
14. Received audio at local station is distorted or noisy when SQUELCH switch is in either TONE or CARR position.	Defective transmitter section of the fm receiver-transmitter.	Replace defective fm receiver-transmitter.
15. Weak received and transmitted audio.	*a.* Loose connections or damaged coaxial cable between fm receiver-transmitter and fm antenna.	*a.* Tighten loose connections and inspect coaxial cable for damage. If coaxial cable is damaged, replace coaxial cable.
	b. Defective fm antenna.	*b.* Replace defective fm antenna.
16. Weak transmitted signal. Received audio normal.	Defective transmitter amplifier in fm receiver-transmitter.	Replace defective fm receiver-transmitter.

Symptom	Probable cause	Corrective measures
17. Weak received audio signal. Transmitted signal normal.	Defective transmitter amplifier in fm receiver-transmitter.	Replace defective fm receiver-transmitter.
18. No homing signals heard in headsets nor apparent display of homing signals on course selector indicator ID-1347.	*a.* Defective mode selector switch on fm control panel.	*a.* Replace defective fm control panel.
	b. Open diode (CR33) on TB71.	*b.* Check front to back ratio of diode; ensure mode selector switch on fm control panel is not in HOME position. Replace diode if front to back ratio is not at least 1:100 or if diode is open.
	c. Defective homing circuits in fm receiver-transmitter.	*c.* Replace defective fm receiver-transmitter.
	d. Loose connections or damaged coaxial cable between fm receiver-transmitter and fm homing antenna.	*d.* Tighten loose connections and inspect for physical damage. If coaxial cable is damaged, replace coaxial cable.
	e. Defective fm homing antenna.	*e.* Replace defective fm homing antenna.
	f. Open homing mode circuit between fm control panel P2107 pin DD and TB71 terminal 1 or between TB71 terminal 2 and fm receiver-transmitter P2106 pin 16.	*f.* Make continuity check of homing mode circuit. (See figure FO-6.) Repair or replace defective wiring as applicable.
19. Neither pointer indicates any input to the course selector indicator ID-1347 but the flags disappear. Homing signals are heard in the headsets.	Defective relay K53.	Replace defective relay.
20. Neither flag disappears but pointers indicate input to course selector indicator ID-1347. Homing signals are heard in the headsets.	Defective relay K54.	Replace defective relay.

3–10. Troubleshooting Radio Set AN/ARC-114 No. 2 FM Liaison Facility

a. Facility Performance Test. The interphone facility's No. 2 fm liaison radio transmission and reception performance test is made in conjunction with the No. 2 fm liaison facility's performance test.

(1) Ensure the FM 2 ARC-114, INTER COM PLT & CREW-R, and INTER COM CPLT & CREW-L circuit breakers are depressed and engaged.

(2) On each ICS control panel, position the controls as follows:

Rotary selector switch	ICS
No. 5 mixer switch	ON (up)
All other mixer switches	OFF (down)
VOL control	Midrange

(3) On the No. 2 fm liaison receiver-transmitter, position the controls as follows and allow a 1-minute warmup time.

Mode selector switch	T/R
Frequency controls	32.10 MEGACYCLES
VOL control	Midrange

(4) Depress and hold the RCVR TEST pushbutton switch on the fm receiver-transmitter and listen for an 800 Hz tone in the headset at each interphone station. Verify that receiver background noise is cut out and a clear distinct tone is heard.

(5) Release the RCVR TEST pushbutton switch.

(6) Reset the frequency controls for 34.10, 41.50, 46.65, and 72.05 MEGACYCLES (one frequency setting at a time) and repeat previous substeps (4) and (5) at one of the interphone stations.

(7) Reset the frequency controls to an active authorized frequency in the lower portion of the fm radio set frequency range.

(8) Rotate the AUDIO control cw and ccw. Received audio volume level heard in the headsets should increase and decrease, respectively, and the received audio should be clear and distinct. Set the AUDIO control for comfortable volume level as heard in the headsets.

(9) On each ICS control panel, position the No. 5 mixer switch to OFF (down). Received audio should not be heard at any interphone station.

(10) On each ICS control panel, position the rotary selector switch to 5. Received audio should be heard at each interphone station.

(11) At the pilot's station, key the fm radio set for transmission and establish communications with the local station. Sidetone should be clear, distinct, and of adequate volume. Received audio at the local station should be clear, distinct, and of adequate volume.

(12) Repeat previous step (11) at the co-pilot's, left crewmember's, and right crewmember's stations.

(13) Reset the frequency controls on the fm receiver-transmitter to an active authorized frequency in the middle portion of the fm radio set frequency range and repeat previous substep (11).

(14) Reset the frequency controls on the fm receiver-transmitter to an active authorized frequency in the upper portion of the fm radio set frequency range and repeat previous substep (11).

(15) Position the function selector switch on the fm receiver-transmitter to T/R GUARD.

(16) Establish communications with a local station, such as the control tower, and request a test transmission on the vhf-fm guard channel frequency (40.50 MHz) from the local station.

NOTE

Perform the following three steps as quickly as possible to limit transmission time on the vhf-fm guard channel frequency.

(17) Listen for the test transmission on the uhf-fm guard channel. Received audio on the guard channel should be clear, distinct, and of adequate volume.

(18) On the fm receiver-transmitter, position the function selector switch to T/R. Guard channel audio should not be heard.

(19) Reset the frequency controls for 40.50 MEGACYCLES. Received audio on guard channel frequency should be heard clear, distinct, and of adequate volume.

NOTE

The HOMING mode is not operational in this installation.

NOTE

The RETRAN mode is not normally checked while on the ground. If requirements exist that this mode be checked in conjunction with the AN/ARC-54 or AN/ARC-131 No. 1 fm liaison facility, two local stations are required operating at least 2 MHz apart.

(20) On the fm receiver-transmitter, reset the frequency controls for the local station frequency and position the function selector switch to OFF.

(21) On each ICS control panel, position the rotary selector switch to ICS.

b. Radio Set AN/ARC-114 No. 2 FM Liaison Facility Troubleshooting Chart.

Symptom	Probable cause	Corrective measures
1. No tone, received audio, or sidetone at any interphone station.	*a.* Defective fm receiver-transmitter.	*a.* Remove fm receiver-transmitter, reset circuit breaker and measure for +28 vdc at P3302 pin D to chassis ground. If +28 vdc is present at P3302 pin D, replace defective fm receiver-transmitter.
	b. Defective FM 2 ARC-114 circuit breaker (CB33).	*b.* If +28 vdc not present at P3302 pin D, replace defective circuit breaker.
	c. Open primary power or ground circuit.	*c.* Make continuity checks of primary power and ground lines to the fm receiver-transmitter. (See figure FO-7.) Repair or replace wiring as applicable.
	d. Defective impedance matching network (A16).	*d.* Make continuity check between pins 26 and d and resistance check between pins 26 and 28 on board. If open exists between pins 26 and d or short exists between pins 26 and 28, replace defective impedance matching network (A16).

Symptom	Probable cause	Corrective measures
	e. Open receiver audio line between fm receiver-transmitter P3302 pin d, impedance matching network (A16) J600 pins d and 26, and TB20 terminal 12.	*e.* Make continuity check of receiver audio line. (See figure FO-7 and FO-3.) Repair or replace wiring as applicable.
2. No tone or received audio heard at one of the interphone stations.	*a.* Defective No. 5 mixer switch on applicable ICS control panel.	*a.* Replace defective ICS control panel.
	b. Defective headset, receiver audio amplifier in ICS control panel, or open wiring between headset and ICS control panel.	*b.* Refer to interphone facility troubleshooting, paragraph 3-6.
	c. Open wiring between ICS control panel connector pin EE and TB20 terminal 12 or TB70 section 6 terminals A or B as applicable.	*c.* Make continuity check of fm receiver audio line. (See figure FO-3.) Repair or replace wiring as applicable.
3. Receiver background noise is not squelched.	Defective or maladjusted squelch circuits in fm receiver-transmitter.	Replace defective fm receiver-transmitter.
4. Receiver audio not adjustable with the AUDIO control.	Defective AUDIO control in fm receiver-transmitter.	Replace defective fm receiver-transmitter.
5. Receiver audio still heard in headset at one of the ICS control panels when the No. 5 mixer switch is positioned to OFF and rotary selector switch is in the ICS position.	Defective No. 5 mixer switch in ICS control panel.	Replace defective ICS control panel.
6. Receiver audio is not heard in headset at one of the ICS control panels when rotary selector switch is positioned to 5.	Defective rotary selector switch on ICS control panel.	Replace defective ICS control panel.
7. Sidetone or received audio is not clear, distinct, or of adequate volume at any interphone station.	Defective or misaligned receiver section in fm receiver-transmitter.	Replace defective fm receiver-transmitter.

Symptom	Probable cause	Corrective measures
8. Sidetone or received audio is not clear, distinct, or of adequate volume at one of the interphone stations.	Defective transmit or receiver audio amplifier in ICS control panel.	Refer to interphone facility troubleshooting, paragraph 3-6.
9. Received audio at local station is not clear or distinct when using any of the interphone stations.	*a.* Defective or misaligned transmitter section of fm receiver-transmitter.	*a.* Replace defective fm receiver-transmitter.
	b. Defective diode in audio threshold detector (Z20).	*b.* Replace defective audio threshold detector (Z20).
10. Received audio at local station is not clear or distinct when using one of the interphone stations.	Defective transmit audio amplifier in ICS control panel.	Refer to interphone facility troubleshooting, paragraph 3-6.
11. No sidetone heard; communications can be established with local station.	Defective sidetone circuits in fm receiver-transmitter.	Replace defective fm receiver-transmitter.
12. Cannot establish communications with local station(s) or received audio at local station(s) is weak; sidetone volume level may be weak.	*a.* Loose connections or damaged rf cables between fm receiver-transmitter and fm filter (FL5) or fm filter (FL5) and antenna.	*a.* Tighten loose connections and replace damaged rf cables; try communications check again. If malfunction is not corrected, refer to next probable cause.
	b. Defective power amplifier stage or frequency modulation stage of fm receiver-transmitter.	*b.* Insert wattmeter with 25-250 MHz element between antenna connector on fm receiver-transmitter and rf cable connector P3300, and key radio set for transmission. Monitor transmitted and reflected power: transmitted power should be not less than 9 watts and reflected power should not exceed 0.44 times the transmitted power. If transmitted power is less than 9 watts or both the transmitted power and reflected power check good, replace the defective fm receiver-transmitter. If the reflected power is too

Symptom	Probable cause	Corrective measures
		high, refer to next probable cause. NOTE If the transmitted power and reflected power both check good, the frequency modulation circuits may be malfunctioning.
	c. Defective rf cable between fm receiver-transmitter and fm filter (FL5).	*c.* Insert wattmeter between fm filter (FL5) input and rf cable connector P3202; test the transmit and reflected power again. If transmit power is too low, replace defective rf cable. If reflected power is too high refer to next probable cause.
	d. Defective fm filter (FL5).	*d.* Insert wattmeter between fm filter output and rf cable connector P3203; test the transmit and reflected power again. If transmit power is too low, replace defective fm filter (FL5). If reflected power is too high refer to next probable cause.
	e. Defective rf cable between fm filter (FL5) and antenna.	*e.* Insert wattmeter between antenna and rf cable connector P1906; test the transmit and reflected power again. If transmit power is too low replace rf cable.
	f. Defective antenna (AS-1703/AR)	*f.* If reflected power is too high in previous test, replace the defective antenna.
13. Cannot establish communications with any local stations. No sidetone heard in headset at any inter-	*a.* Defective transmitter section or transmit/receive relay in fm receiver-transmitter.	*a.* Replace defective fm receiver-transmitter.

Symptom	Probable cause	Corrective measures
phone station. Received audio normal.	*b.* Defective audio transformer in audio threshold detector (Z20).	*b.* Replace defective audio threshold detector (Z20).
	c. Open transmit audio line from TB20 terminal 7 to audio threshold detector P3303 pin L or from P3303 pin R to fm receiver-transmitter P3302 pin K.	*c.* Make continuity check of transmit audio line. (See figures FO-7 and FO-3.) Repair or replace wiring as applicable.
	d. Open transmit control line from audio threshold detector (Z20) P3304 pin h to fm receiver-transmitter P3303 pin h.	*d.* Make continuity check of transmit control line. (See figures FO-7 and FO-3.) Repair or replace wiring as applicable.
14. Cannot establish communications with any local stations from one of the interphone stations. No sidetone heard in the headset. Received audio normal.	*a.* Defective rotary selector switch or transmit relay in ICS control panel.	*a.* Replace defective ICS control panel.
	b. Defective diode in audio threshold detector (Z20).	*b.* Replace defective audio threshold detector (Z20).
	c. Open transmit audio line from pin P on ICS control panel connector to TB20 terminal 7 or TB70 section 2 terminal D or E as applicable.	*c.* Make continuity check of transmit audio line. (See figure FO-3.) Repair or replace wiring as applicable.
	d. Open transmit control line from pin BB on ICS control panel connector to audio threshold detector P3304 pin W, a, K, or e (pilot, copilot, right and left crewmember, respectively) as applicable.	*d.* Make continuity check of transmit control line. (See figure FO-3.) Repair or replace wiring as applicable.
15. No received audio on guard channel. Function selector switch on fm receiver-transmitter in T/R GUARD position and authorize local station frequency selected.	Defective guard channel receiver or function selector switch in fm receiver-transmitter.	Replace defective fm receiver-transmitter.
16 Received audio on guard channel still heard in headsets when function selector switch on fm receiver-	Defective function selector switch on fm receiver-transmitter.	Replace defective fm receiver-transmitter.

Symptom	Probable cause	Corrective measures
transmitter is positioned to T/R and authorized local station frequency selected.		
17. No received audio on guard channel. Function selector switch on fm receiver-transmitter is in T/R position but guard channel frequency (40.50 MHz) selected.	Defective frequency selection circuits of main receiver in fm receiver-transmitter.	Replace defective fm receiver-transmitter.

3–11. Troubleshooting Radio Set AN/ARC-102 HF-SSB Facility

a. Facility Performance Test. The interphone facility's hf radio transmission and reception performance test is made in conjunction with the ARC-102 hf facility performance test.

(1) Ensure the ARC-102 HF STATIC INVERTER, HF ANT COUPLER, HF ARC-102, INTER COM PLT & CREW-R, and INTER COM CPLT & CREW-L circuit breakers are depressed and engaged.

(2) On each ICS control panel, position the controls as follows:

Rotary selector switch	ICS
No. 4 mixer switch	ON (up)
All other mixer switches	OFF (down)
VOL control	Midrange

(3) On the hf control panel, position the controls as follows and allow at least a 5-minute warmup time.

Function selector switch	AM
Frequency controls	5.000 MHz
RF SENS control	Midrange (comfortable audio reception level)

(4) Ensure the blower in the hf receiver-transmitter is operating.

(5) Listen for the announcement interval of the National Bureau of Standards (NBS) frequency channel at each interphone station. Voice quality of received audio during announcement intervals should be clear, distinct, and of adequate volume.

(6) On the hf control panel, rotate the RF SENS control cw and ccw. Volume level of received audio as heard in the headsets should increase and decrease respectively. Set the RF SENS control for a comfortable volume level.

(7) On the hf control panel, position the function selector switch first to LSB and then to USB while listening to announcement audio. Voice quality of received audio should be clear, distinct, and of adequate volume.

(8) On the hf control panel, select NBS frequencies of 2.500, 10.000, 15.000, 20.000, and 25.000 MHz, if available, and repeat previous substeps (5) and (7) at each NBS frequency setting.

NOTE

Upon completion of each tuning cycle, wait at least 30-seconds before selecting a new frequency. This will prevent overheating of time delay relay K711 in the hf receiver-transmitter.

NOTE

All NBS frequencies listed may not be available or within reception capabilities of the hf radio set. Select only those frequencies which are available and within reception capabilities of the hf radio set.

(9) On each of the ICS control panels, position the No. 4 mixer switch to OFF (down). Received audio should not be heard at any interphone station.

(10) On each ICS control panel, position the rotary selector switch to 4. Received audio on NBS frequency should be heard at each interphone station.

(11) On the hf control panel, select an authorized frequency which is inactive but may be used for transmission tests, and position the selector switch to AM.

(12) On the front panel of the hf receiver-transmitter, position the meter selector switch to 28V. The meter should indicate in the red area.

(13) Position the meter selector to 130V. The meter should indicate in the red area.

(14) Position the meter selector to 1500V. The meter should indicate zero.

CAUTION

The blower in the hf receiver-transmitter must speed up when the transmitter is keyed. If it does not, immediately cease keying the hf receiver-transmitter. Investigate and correct the malfunction before proceeding with any other transmission tests.

(15) At one of the interphone stations, key the hf radio set for transmission (do not speak into the microphone) and observe the meter indication on the hf receiver-transmitter. The meter should indicate in the red area. Cease keying.

(16) On the front panel of the hf receiver-transmitter, position the meter switch to PA MA. The meter should indicate zero.

(17) Disconnect the coaxial cable jumper from the 500 KC STD jack on the right-front panel of the hf receiver-transmitter.

(18) At one of the interphone stations, key the hf radio set for transmission (do not speak into the microphone) and note the meter indication on the hf receiver-transmitter. The meter should indicate approximately 300 ma. Cease transmitting.

(19) Reconnect the coaxial cable jumper to the 500 KC STD jack.

(20) At one of the interphone stations, key the hf radio set for transmission and speak into the microphone. On the hf receiver-transmitter, the meter should indicate in the red area and should not vary while speaking into the microphone. Cease transmitting.

(21) On the hf control panel, position the function selector switch to LSB.

(22) On the front panel of the hf receiver-transmitter, position the meter switch to PA MA. The meter should indicate zero.

(23) At one of the interphone stations, key the hf radio set (do not speak into the microphone) and observe the meter indication on the hf receiver-transmitter. The meter should indicate approximately 260 ma.

(24) While keying the hf radio set, speak into the microphone and observe the meter indication on the hf receiver-transmitter and note sidetone in the headset. The meter indication should vary in relationship to the applied audio reaching the red area (approximately 500 ma) upon audio peaks. Sidetone as heard in the headsets should be clear, distinct, and of adequate volume.

(25) On the hf control panel, position the function selector switch to USB and repeat previous substeps (22) through (24).

(26) On the hf control panel, position the function selector switch to AM and select a frequency of 2.000 MHz. Ensure the frequency is free of other radio communications.

NOTE

If the hf radio set is already set to 2.000 MHz, briefly select another frequency and then return the frequency selection to 2.000 MHz.

(27) At one of the interphone stations, momentarily (approximately 5-seconds) key the hf radio set for transmission and observe the TUNE and OPR indicator lights on the CU-1658( )/A impedance matching network. The TUNE indicator lights when reflected power is present and should stay lighted until the hf

impedance matching network is tuned (5.0 seconds maximum). When time cycle is complete, the TUNE indicator light (amber) should go out and the OPR indicator light (green) should light.

NOTE

During the tune cycle, a 1000 Hz tone should be heard in the headsets, indicating that the impedance matching network is tuning, and should stop upon completion of the tuning cycle coinciding with the OPR indicator light illuminating.

(28) Repeat previous substeps (26) and (27) for frequency selections of 7.000, 14.000, 22.000, and 29.999 MHz.

(29) On the hf control panel, position the function selector switch to AM and select an authorized frequency in the lower portion if possible of the hf radio set frequency range that is active. Received audio should be clear, distinct, and of adequate volume.

(30) At each interphone station (one at a time), key the hf radio set and establish communications with the active ground station. Sidetone should be clear, distinct, and of adequate volume. Received audio at active station should be clear, distinct, and of adequate volume.

NOTE

Do not attempt to transmit voice when the 1000 Hz tune cycle tone is heard in the headsets. Wait until the tune cycle is complete and the 1000 Hz tone stops, then proceed with normal transmission.

(31) Repeat previous substeps (29) and (30) for a frequency in the middle and upper portion of the hf radio set frequency range using only one of the interphone stations.

(32) On the hf control panel, position the function selector switch to LSB and repeat previous substeps (29) through (31) using only one of the interphone stations.

(33) On the hf control panel, position the function selector switch to USB and repeat previous substeps (29) through (31) using only one of the interphone stations.

(34) On the hf control panel, position the function selector switch to OFF.

(35) On each ICS control panel, position the rotary selector switch to ICS.

b. Radio Set AN/ARC-102 (HF-SSB) Facility Troubleshooting Chart.

Symptom	Probable cause	Corrective measures
1. No received audio or receiver noise heard at any interphone station.	*a.* Defective resistor (R602) in impedance matching network (A16) of the interphone facility.	*a.* Connect a headset to the PHONE jack on the front of the hf receiver-transmitter and listen for receiver noise and audio. If receiver noise and audio are present, replace impedance matching network (A16). If receiver noise and audio are not present, refer to next probable cause.
	b. Defective function selector switch on hf control panel	*b.* Make a voltage check on TB44 terminal 7 for +28 vdc to ground. If +28 vdc is present, replace defective hf control

Symptom	Probable cause	Corrective measures
		panel. If voltage check indicates zero volts, refer to next probable cause.
	c. Defective low voltage power supply (A5) in hf receiver-transmitter.	*c.* Perform performance test procedures substeps (11) through (13). If the meter indication is satisfactory for the 28 volt selection but zero for the 130 volt selection, replace the defective hf receiver-transmitter.
	d. Defective audio amplifier (A9) in hf receiver-transmitter.	*d.* If the meter indication in performance test is satisfactory for both selections, replace defective hf receiver-transmitter.
	e. Defective interlock relay (K9) in hf receiver-transmitter.	*e.* If the meter indication in performance test indicates zero for both selections, make voltage checks at TB44 terminals 4, 5, and 6 for +28 vdc to ground. If +28 vdc is present at all three terminals, replace hf receiver-transmitter.
	f. Defective PP3702/ ARC-102 power supply.	*f.* If replacing the hf receiver-transmitter in previous corrective measure did not correct the malfunction, replace the power supply unit and mount.
	g. Defective HF ARC-102, HF STATIC INVERTER, or HF ANT COUPLER circuit breakers (CB34, CB36, or CB35 respectively).	*g.* If +28 vdc is not present at TB44 terminals 4, 5, and 6, replace HF ARC-102 circuit breaker (CB34).
	h. Defective HF STATIC INVERTER circuit breaker (CB36).	*h.* If +28 vdc is not present at TB44 terminal 5 only, replace defective circuit breaker.
	i. Defective HF ANT COUPLER circuit breaker (CB35).	*i.* If +28 vdc is not present at TB44 terminal 6 only, replace defective circuit breaker.

Symptom	Probable cause	Corrective measures
2. Blower in hf receiver-transmitter does not operate or does not speed up when the hf receiver-transmitter is keyed for transmission.	Defective blower or control circuits in hf receiver-transmitter.	Replace defective hf receiver-transmitter.
3. No received audio at one of the interphone stations. ICS control panel rotary selector switch positioned to ICS and No. 4 mixer switch positioned to ON.	*a.* Defective No. 4 mixer switch on ICS control panel. *b.* Open wiring between ICS control panel connector pin MM and TB20 terminal 11 or TB70 section 5 terminal F or G as applicable. *c.* Defective headset, audio amplifier in ICS control panel, or wiring between headset and ICS control panel.	*a.* Replace defective ICS control panel. *b.* Make continuity checks of receiver audio wiring. (See figure FO-3.) Repair or replace wiring as applicable. *c.* Refer to interphone facility troubleshooting, paragraph 3-6.
4. Distorted, noisy, or inadequate volume of received audio at all interphone stations.	Defective audio amplifier (A9) in hf receiver-transmitter.	Replace defective hf receiver-transmitter.
5. Volume level of received audio does not vary when the RF SENS control on the hf control panel is rotated.	*a.* Defective RF SENS control on hf control panel. *b.* Defective rf sensitivity circuits in hf receiver-transmitter.	*a.* Replace defective hf control panel. *b.* Replace defective hf receiver-transmitter.
6. Received voice audio distorted, noisy, or of inadequate volume or no voice audio received when the USB or LSB functions are selected on the hf control panel.	Defective sideband circuit in hf receiver-transmitter.	Replace defective hf receiver-transmitter.
7. No received audio on certain frequencies selected that are known to be active.	*a.* Defective frequency selection circuits or controls in hf control panel. *b.* Defective autopositioner in hf receiver-transmitter. *c.* Open frequency selection wiring between hf control panel connector P1808 and hf receiver-transmitter connector P1806.	*a.* Replace defective hf control panel. *b.* Replace defective hf receiver-transmitter. *c.* Make continuity checks of frequency selection wiring. (See figure FO-8.) Repair or replace wiring as applicable.

Symptom	Probable cause	Corrective measures
8. Receiver audio still heard in headset when No. 4 mixer switch on ICS control panel is positioned to OFF and rotary selector switch is in the ICS position.	Defective No. 4 mixer switch in ICS control panel.	Replace defective ICS control panel.
9. No received audio heard at one of the interphone stations when ICS control panel rotary selector switch is positioned to 4. No. 4 mixer switch is OFF.	Defective rotary selector switch on ICS control panel.	Replace defective ICS control panel.
10. One or more of the hf receiver-transmitter meter indications is not as stated.	Defective hf receiver-transmitter.	Replace defective hf receiver-transmitter.
11. No sidetone heard at any interphone station; hf control panel function selector switch positioned to LSB or USB; hf receiver-transmitter meter switch positioned to PA MA; meter indication does not vary with voice audio input. Received audio normal.	*a.* Defective sidetone amplifier, in audio amplifier (A9), high voltage power (A8), keying relay (K3), or sidetone relay (K6) in hf receiver-transmitter. *b.* Open transmit control line between audio threshold detector P3304 pin E and TB19 terminal 8.	*a.* Replace defective hf receiver-transmitter. *b.* Make continuity check of transmit control circuit. (See figures FO-8 and FO-3.) Repair or replace wiring as applicable.
12. Weak or distorted sidetone at all interphone stations. Received audio good.	Defective sidetone amplifier in hf receiver-transmitter.	Replace defective hf receiver-transmitter.
13. Weak or distorted sidetone and received audio at one interphone station.	Defective receiver audio amplifier in ICS control panel.	Replace defective ICS control panel.
14. No sidetone and received audio at one interphone station.	Defective headset, receiver audio amplifier in ICS control panel, or wiring between headset and ICS control panel.	Refer to interphone facility troubleshooting, paragraph 3-6.
15. TUNE light on CU-1658( )/A impedance matching network does not light when hf	*a.* Defective power amplifier (A11) in hf receiver-transmitter.	*a.* Replace defective hf receiver-transmitter.

Symptom	Probable cause	Corrective measures
radio set is keyed for transmission. Tune tone (1000 Hz) signal not heard in headsets.	*b.* Defective CU-1658( )/A impedance matching network.	*b.* Replace defective CU-1658( )/A impedance matching network.
16. TUNE light on CU-1658( )/A impedance matching network does not go out but OPR light comes on. Tune tone (1000 Hz) still heard in headsets.	*a.* Defective CU-1658( )/A impedance matching network.	*a.* Replace defective CU-1658( )/A impedance matching network.
	b. Defective connection between CU-1658( )/A impedance matching network antenna terminal and longwire antenna.	*b.* Check connections for security and wire for physical damage. Repair connections or replace wire if damaged.
	c. Defective longwire antenna.	*c.* Replace defective longwire antenna.
17. OPR light on CU-1658( )/A impedance matching network does not light. TUNE light was on then went off and tune tone (1000 Hz) is no longer heard in the headsets.	Defective CU-1658( )/A impedance matching network.	Replace defective CU-1658( )/A impedance matching network.
18. No tune tone (1000 Hz) heard in headsets during tuning cycle. Operation of TUNE and OPR indicator lights on CU-1658( )/A impedance matching network is as stated.	Defective CU-1658( )/A impedance matching network.	Replace defective CU-1658( )/A impedance matching network.
19. Distorted or weak received audio at ground station. Sidetone is good.	Defective audio amplifier (A9) or power amplifier (A11) in hf receiver-transmitter.	Replace defective hf receiver-transmitter.
20. Cannot establish communications with any ground station within communications range.	Defective transmit-receive relay (K5), power amplifier (A11), high voltage power supply (A8), or keying relay (K6) in hf receiver-transmitter.	Replace defective hf receiver-transmitter.
21. Cannot establish communications with one or more ground stations known to be active and within communications range.	*a.* Defective frequency selector controls on hf control panel.	*a.* Replace defective hf control panel.
	b. Defective autopositioner (A12) in hf receiver-transmitter.	*b.* Replace defective hf receiver-transmitter.
	c. Open frequency selection wiring between hf control panel P1808 and hf	*c.* Make continuity checks of frequency selection wiring. (See figure

Symptom	Probable cause	Corrective measures
	receiver-transmitter P1806.	FO-8.) Repair or replace wiring as applicable.
22. Cannot establish communications with any ground station on one of the available modes (AM, LSB, or USB)	*a.* Defective function selector switch on hf control panel. *b.* Defective if translator (A3) in hf receiver-transmitter. *c.* Open function select control wiring between hf control panel P1808 and hf receiver-transmitter P1806.	*a.* Replace defective hf control panel. *b.* Replace defective hf receiver-transmitter. *c.* Make continuity checks of function select control wiring. (See figure FO-8.) Repair or replace wiring as applicable.

3–12. Troubleshooting Direction Finder Set AN/ARN-83 ADF Facility

a. Facility Performance Test. The interphone facility's navigation reception performance test is made in conjunction with the ARN-83 adf facility performance test.

(1) Ensure the LF NAV ADF, INTER COM PLT & CREW-R, INTER COM CPLT & CREW-L, and COURSE IND (ac circuit breaker panel) circuit breakers are depressed and engaged.

(2) On each ICS control panel, position the controls as follows:

NAV mixer switch	NAV (up)
All other mixer switches	OFF (down)
Rotary selector switch	ICS
VOL control	Midrange

(3) On the adf control panel, position the controls as follows and permit a 5-minute warmup time.

Mode switch	ANT
BFO/OFF switch	OFF
Band switch	190-400 KHz
TUNE control	Any position
GAIN control	Midrange (receiver noise at comfortable level)

(4) On adf control panel, select a number of active frequencies across the band range using the TUNE control. Received audio should be clear, distinct, and of adequate volume as heard in the headset at each interphone station. The tuning meter should deflect to the right at each active frequency. Maximum deflection indicates center frequency at station selected.

(5) Select a specific active frequency which can be identified and note frequency and band range of adf control panel. The frequency and band range selection on the adf control panel should agree with the known or identified transmitting station frequency.

(6) On the adf control panel, position the band switch to 400-850 KHz and repeat previous substeps (4) and (5).

(7) On the adf control panel, position the band switch to 850-1750 KHz and repeat previous substeps (4) and (5).

(8) On each ICS control panel, position the NAV mixer switch to OFF (down) and listen in the headsets. Received audio should cease being heard in the headsets. Return the NAV mixer switch to NAV (up).

(9) On the adf control panel, position the BFO/OFF switch to BFO and, using the TUNE control, slowly sweep across a known active station frequency. A beat frequency should be heard in the headsets on either side of the active station frequency and should decrease to a zero beat when the adf receiver is tuned to the active station frequency. Simultaneously, the tuning meter should indicate the greatest deflection at zero beat condition.

(10) On the adf control panel, position the BFO/OFF switch to OFF and, using the TUNE control and tuning meter, tune the adf receiver to an audible signal.

(11) Position the mode selector switch to LOOP and rotate the LOOP L/R control to R (extreme right). The No. 1 pointer on both the ID-998/ARN radio magnetic indicator and the ID-250A/ARN course indicator should smoothly rotate clockwise.

(12) Release the LOOP L/R control to a half-right position. The No. 1 pointer on both indicators should smoothly rotate clockwise slower than in previous substep (11).

(13) Repeat previous substeps (11) and (12) with the LOOP L/R control positioned to L (extreme left) and half-left. The No. 1 pointer on both indicators should smoothly rotate counterclockwise.

(14) Release the LOOP L/R control. The LOOP L/R control should return to center position and the No. 1 pointer on each indicator should stop rotation.

(15) Rotate the LOOP L/R control first left then right so that the No. 1 pointer on both indicators rotates through a full 360 degrees in both directions. Both the audible signal heard in the headsets and the tuning meter deflection on the adf control panel should indicate two nulls, 180 degrees apart, as the loop antenna is rotated through a full 360 degrees.

(16) On the adf control panel, position the mode selector switch to ADF and tune the adf receiver to several stations. The No. 1 pointer on the ID-998/ARN radio magnetic indicator and the ID-250A/ARN course indicator should respond to each station selected and indicate relative bearing to the station.

NOTE

The accuracy of the bearing indication cannot be determined under these test conditions due to reflections and ground effects.

(17) On the adf control panel, position the mode selector switch to OFF.

b. Direction Finder Set AN/ARN-83 (ADF) Facility Troubleshooting Chart.

Symptom	Probable cause	Corrective measures
1. Distorted or weak reception of audio on all three bands and all frequencies selected as heard at all interphone stations.	*a.* Defective adf receiver.	*a.* Replace defective adf receiver.
	b. Loose connections or damaged coaxial cable between adf receiver and sense antenna.	*b.* Tighten loose connections and inspect coaxial cable for physical damage. Replace damaged coaxial cable.
	c. Defective adf sense antenna.	*c.* Replace defective adf sense antenna.
2. Distorted or weak reception of audio on all three bands and all frequencies selected at one interphone station.	Defective receiver audio amplifier in ICS control panel or defective headset.	Refer to interphone facility troubleshooting, paragraph 3-6.

Symptom	Probable cause	Corrective measures
3. No audio reception or receiver noise heard at any interphone station.	*a.* Defective LF NAV ADF circuit breaker.	*a.* Check to see if adf control panel lights are illuminated. If panel lights are not illuminated, replace defective circuit breaker.
	b. Defective adf receiver.	*b.* Replace defective adf receiver.
	c. Defective adf sense antenna.	*c.* Replace defective adf sense antenna.
	d. Defective GAIN control on adf control panel.	*d.* Replace defective adf control panel.
	e. Open resistor (R613) in interphone facilities impedance matching network (A16).	*e.* Make resistance check of R613 from P600 pin 18 to pin V in accordance with paragraph 4-3. If open is indicated, replace impedance matching network (A16).
	f. Open receiver audio wiring from adf receiver to TB19 terminal 3 or coaxial cable from adf receiver to adf sense antenna.	*f.* Make continuity checks of receiver audio wiring and of coaxial cable. (See figure FO-9.) Repair or replace wiring and/or coaxial cable as applicable.
4. No audio reception or receiver noise heard at one interphone station.	*a.* Defective NAV mixer switch on ICS control panel.	*a.* Replace defective ICS control panel.
	b. Open adf receiver audio wiring between ICS control panel connector pin WW and TB19 terminal 3 or TB70 section 6 terminal F or G as applicable.	*b.* Make continuity check of adf receiver audio wiring. (See figure FO-3.) Repair or replace wiring as applicable.
5. Receiver audio still heard at one of the interphone stations when NAV mixer switch on ICS control panel is positioned to OFF.	Defective NAV mixer switch on ICS control panel.	Replace defective ICS control panel.
6. Frequency setting on adf control panel does not agree with known or identified station frequency.	*a.* Defective band switch on adf control panel.	*a.* Replace defective adf control panel.
	b. Defective band switching circuits in adf receiver.	*b.* Replace defective adf receiver.
	c. Open band selection wiring between adf control panel connector P302 and adf receiver connector P407.	*c.* Make continuity checks of band selection wiring. (See figure FO-9.) Repair or replace wiring as applicable.

Symptom	Probable cause	Corrective measures
7. Tuning meter does not deflect when received audio is present from active station.	*a.* Defective tuning meter on adf control panel. *b.* Defective tuning meter drive circuits in adf receiver. *c.* Open tuning meter wiring between adf control panel connector P302 pin t and adf receiver connector P407 pin 22.	*a.* Replace defective adf control panel. *b.* Replace defective adf receiver. *c.* Make continuity check of tuning meter wiring. (See figure FO-9.) Repair or replace wiring as applicable.
8. No beat frequency heard when tuning across active station frequency. BFO/OFF switch on adf control panel positioned to BFO. Tuning meter deflects properly.	*a.* Defective BFO/OFF switch on adf control panel. *b.* Defective beat frequency oscillator in adf receiver. *c.* Open BFO wiring between adf control panel connector P302 pin F and adf receiver P407 pin 15.	*a.* Replace defective adf control panel. *b.* Replace defective adf receiver. *c.* Make continuity check of BFO wiring. (See figure FO-9.) Repair or replace wiring as applicable.
9. No rotation of No. 1 pointer on either the ID-998/ASN radio magnetic indicator or the ID-250A/ARN course indicator when LOOP mode is selected and LOOP L/R control rotated in either direction.	*a.* VOR/ADF switch on ID-998/ASN radio magnetic indicator is positioned to VOR. *b.* Defective mode switch or LOOP L/R control on adf control panel. *c.* Defective loop control circuits in adf receiver. *d.* Defective COURSE IND circuit breaker. *e.* Defective ID-998/ASN radio magnetic indicator. *f.* Open loop control wiring between adf control panel connector P302 and adf receiver connector P407 or 26 vac wiring from COURSE IND circuit breaker to adf control panel, adf receiver, or ID-998/ASN radio magnetic indicator.	*a.* Position VOR/ADF switch on ID-998/ASN radio magnetic indicator to ADF. *b.* Replace defective adf control panel. *c.* Replace defective adf receiver. *d.* Replace defective circuit breaker. *e.* Replace defective radio magnetic indicator. *f.* Make continuity checks of loop control wiring and 26 vac wiring. (See figure FO-9.) Repair or replace wiring as applicable.
10. No rotation of ID-250A/ARN course indicator No. 1 pointer. Rotation of ID-998/ASN radio magnetic indicator No. 1 pointer is normal.	*a.* Defective ID-250A/ARN course indicator. *b.* Defective VOR/ADF switch on ID-998/ASN radio magnetic indicator. *c.* Open synchro control or	*a.* Replace defective course indicator. *b.* Replace defective radio magnetic indicator. *c.* Make continuity checks

Symptom	Probable cause	Corrective measures
	excitation wiring between ID-250A/ARN course indicator and ID-998/ASN radio magnetic indicator.	of synchro control and excitation wiring. (See figure FO-9.) Repair or replace wiring as applicable.
11. No rotation of ID-998/ASN radio magnetic indicator No. 1 pointer. Rotation of ID-250A/ARN course indicator No. 1 pointer is normal.	Defective ID-998/ASN radio magnetic indicator.	Replace defective radio magnetic indicator.
12. Jerky rotation of the No. 1 pointer on both the ID-998/ASN radio magnetic indicator and the ID-250A/ARN course indicator.	*a.* Defective synchro X or Y generating circuits in adf receiver. *b.* Open synchro X or Y wiring between adf receiver connector P407 and ID-998/ASN radio magnetic indicator connector P403.	*a.* Replace defective adf receiver. *b.* Make continuity checks of synchro wiring. (See figure FO-9.) Repair or replace wiring as applicable.
13. No rotation in one direction of No. 1 pointer on both the ID-998/ASN radio magnetic indicator and ID-250A/ARN course indicator. Rotation in other direction is normal.	*a.* Defective LOOP L/R control on adf control panel. *b.* Defective loop control circuits in adf receiver. *c.* Open loop control wiring between adf control panel connector P302 and adf receiver connector P407.	*a.* Replace defective adf control panel. *b.* Replace defective adf receiver. *c.* Make continuity checks of loop control wiring. (See figure FO-9.) Repair or replace wiring as applicable.
14. Only one speed of rotation of No. 1 pointers on ID-998/ASN radio magnetic indicator and ID-250A/ARN course indicator.	Defective loop control circuits in adf receiver.	Replace defective adf receiver.
15. No null indication, either audio or tuning meter deflection, noted when rotating the No. 1 pointer on both indicators through 360 degrees.	*a.* Defective adf loop antenna. *b.* Loose connections or open coaxial cable between adf receiver and adf loop antenna.	*a.* Replace defective loop antenna. *b.* Tighten loose connections or replace coaxial cable as applicable.
16. No automatic bearing indication by the No. 1 pointer on both indicators when ADF mode is selected on adf control panel.	*a.* Defective mode selector switch on adf control panel. *b.* Defective adf selection circuits in adf receiver.	*a.* Replace defective adf control panel. *b.* Replace defective adf receiver.

Symptom	Probable cause	Corrective measures
	c. Open adf selection wiring between adf control panel connector P302 pin m and adf receiver connector P407 pin 12.	c. Make continuity check of adf selection wiring. (See figure FO-9.) Repair or replace wiring as applicable.

3–13. Troubleshooting Gyromagnetic Compass Set AN/ASN-43

a. Facility Performance Test.

(1) On the ID-998/ASN radio magnetic indicator, the power failure flag should be displayed when power is not applied.

(2) Depress and engage the GYRO CMPS and COURSE IND circuit breakers on the ac power panel. The power failure flag on the ID-998/ASN radio magnetic indicator should no longer be displayed.

(3) Position COMPASS slaving switch on instrument panel to MAG (down).

(4) On the ID-998/ASN radio magnetic indicator, engage and rotate the synchronizing knob in both directions. Both the ID-998/ASN radio magnetic indicator and the ID-250A/ARN course indicator compass cards should rotate smoothly and in conjunction with the synchronizer knob.

NOTE

Tap each indicator lightly before noting any indication throughout the following substeps.

(5) Note annunciator indication and engage and rotate synchronizer knob on the ID-998/ASN until the annunciator indication is centered (null). The heading indication of the ID-250A/ARN course indicator compass card should be within ±2 degrees of compass card indication on the ID-998/ASN radio magnetic indicator.

NOTE

If heading indication is opposite that of the helicopter heading, the gyromagnetic compass set is synchronized on the wrong null position. Engage and rotate the synchronizer knob clockwise until the compass card indicates approximate helicopter heading and repeat substep (5).

(6) Note the exact heading indicated by the compass card on the ID-998/ASN radio magnetic indicator.

(7) Engage and rotate the synchronizer knob clockwise until the compass card indication is 10 degrees greater than that noted in previous substep (6). The annunciator indicator should display a dot (.).

(8) Wait 10 minutes and then note the heading indicated by the compass card. The compass card should display a heading within ±1 degree of that noted in previous substep (6) and annunciator should indicate a null.

(9) Repeat previous substeps (7) and (8) rotating the synchronizer knob counterclockwise for 10 degrees less than noted in previous substep (6). The annunciator should display a cross (X) in substep (7).

(10) Engage and rotate synchronizer knob clockwise until the compass card indication is 30 degrees greater than that noted in previous substep (6). The annunciator indicator should display a dot (.).

(11) Wait 5 minutes and note the compass card heading indication. The heading indicated by the compass card should be between 10 and 25 degrees greater than that noted in previous substep (6) and the annunciator should still display a dot (.).

(12) Repeat previous substeps (10) and (11) rotating the synchronizer knob counterclockwise 30 degrees less than that noted in previous substep (6). The heading after 5 minutes should be between 10 and 25 degrees less than that noted in previous substep (6) and the annunciator should indicate a cross (X) in both substeps.

(13) On the instrument panel, position the COMPASS slaving switch to DG (up). The slaving function should stop and the annunciator should indicate a null.

(14) On the ID-998/ASN radio magnetic indicator, engage and rotate the synchronizer knob to the heading noted in previous substep (6). Annunciator should remain at a null condition (annunciator is deenergized when the COMPASS slaving switch is positioned to DG).

(15) On the CN-998/ASN-43 directional gyro, ensure that the LATITUDE knob is set to the local latitude and the LATITUDE switch is positioned to N for northern hemisphere operation or to S for southern hemisphere operation.

b. Gyromagnetic Compass Set AN/ASM-43 Facility Troubleshooting Chart.

Symptom	Probable cause	Corrective measures
1. Power failure flag on ID-998/ASN radio magnetic indicator is not displayed when power is not applied.	Power failure flag stuck.	Tap face of indicator lightly. If flag appears, normal in-flight operation should be good. If flag does not appear or more than a light tap is required, replace defective indicator.
2. Power failure flag on ID-998/ASN radio magnetic indicator does not disappear when power is applied.	*a.* Defective ID-998/ASN radio magnetic indicator.	*a.* Replace defective indicator.
	b. Defective AM-3209( )/ ASN electronic control amplifier.	*b.* Replace defective electronic control amplifier.
	c. Open power failure wiring between ID-998/ASN radio magnetic indicator connector P403 pin 54 and AM-3209( )/ASN electronic control amplifier connector P415 pin 10.	*c.* Make continuity check of power failure wiring. (See figure FO-10.) Repair or replace wiring as applicable.
	d. Defective GYRO CMPS circuit breaker.	*d.* Measure for 115 vac at TB10 terminal 1 to ground (TB10 terminal 4). If 115 vac is not present, replace defective circuit breaker.
	e. Open primary power wiring between GYRO CMPS circuit breaker and AM-3209( )/ASN electronic control amplifier connector P415 pin 7.	*e.* Make continuity check of primary power wiring. (See figure FO-10.) Repair or replace wiring as applicable.
3. Neither the ID-998/ASN radio magnetic indicator nor the ID-250A/ARN compass indicator compass dials rotate smoothly when synchronizer knob is rotated.	*a.* Defective servo synchronizer control transmitter in ID-998/ASN radio magnetic indicator.	*a.* Replace defective indicator.
	b. Defective AM-3209( )/ ASN electronic control amplifier.	*b.* Replace defective electronic control amplifier.

Symptom	Probable cause	Corrective measures
4. The ID-250A/ARN course indicator does not rotate smoothly when synchronizer knob is turned. Operation of ID-998/ASN radio magnetic indicator compass card is normal.	Defective ID-250A/ARN compass indicator.	Replace defective indicator.
5. Annunciator on ID-998/ASN radio magnetic indicator remains at null state regardless of compass card position. COMPASS slaving switch is in MAG position.	*a.* Defective annunciator in ID-998/ASN radio magnetic indicator. *b.* Defective COMPASS slaving switch. *c.* Defective T-611/ASN compass transmitter. *d.* Defective CN-405/ASN magnetic flux compensator.	*a.* Replace defective indicator. *b.* Replace defective switch. *c.* Replace defective compass transmitter. *d.* Replace defective magnetic flux compensator.
6. ID-250A/ARN compass indicator does not indicate within ±2 degrees of ID-998/ARN radio magnetic indicator indication.	Defective ID-250A/ARN compass indicator.	Replace defective indicator.
7. Incorrect heading indicated. (Large error but not 180 degrees.) Indicators seem to operate normally.	*a.* LATITUDE switch or control on directional gyro set wrong. *b.* Defective ID-998/ASN radio magnetic indicator. *c.* Defective directional gyro. *d.* Defective T-611/ASN compass transmitter. *e.* Defective CN-405/ASN magnetic flux compensator.	*a.* Ensure correct settings for area latitude. *b.* Replace defective indicator. *c.* Replace defective directional gyro. *d.* Replace defective compass transmitter. *e.* Replace defective magnetic flux compensator.
8. Neither compass card rotates but annunciator displays correct symbols and nulls.	*a.* Defective ID-998/ASN radio magnetic indicator. *b.* Defective AM-3209( )/ASN electronic control amplifier. *c.* Defective directional gyro.	*a.* Replace defective indicator. *b.* Replace defective electronic control amplifier. *c.* Replace defective directional gyro.
9. Heading indication does not slave to within ±1 degree of reference heading null.	*a.* Defective directional gyro. *b.* Defective T-611/ASN compass transmitter. *c.* Defective CN-405/ASN magnetic flux compensator.	*a.* Replace defective directional gyro. *b.* Replace defective compass transmitter. *c.* Replace defective magnetic flux compensator.

Symptom	Probable cause	Corrective measures
	d. Defective ID-998/ASN radio magnetic indicator.	*d.* Replace defective indicator.
	e. Defective AM-3209( )/ ASN electronic control amplifier.	*e.* Replace defective electronic control amplifier.
10. Gyromagnetic compass set slaves at wrong rate.	Defective directional gyro.	Replace defective directional gyro.
11. Annunciator does not return and stay at a null state when COMPASS slaving switch is positioned to DG.	Shorted COMPASS slaving switch.	Replace defective switch.

3–14. Troubleshooting Radio Receiver R-1041A/ARN Marker Beacon Facility

a. Facility Performance Test. The interphone facility's marker beacon reception performance test is made in conjunction with the marker beacon facility performance test.

NOTE

Test set I-76 is required to perform the marker beacon facility performance test. This test set consists of the following units:

Test Oscillator	BC-376-H
Test Indicator	BE-67
Headset	HS-23

(1) Ensure the MARKER BEACON R-1041A, INTER COM PLT & CREW-R, and INTER COM CPLT & CREW-L circuit breakers are depressed and engaged.

(2) On the instrument panel, position the MARKER BEACON controls as follows and allow at least 3 minutes warmup time.

VOLUME control/on-off switch	Midrange
SENSING switch	HIGH

(3) Depress the MARKER BEACON press-to-test indicator light. MARKER BEACON indicator light should light when depressed and go out when released.

(4) On each ICS control panel, position the controls as follows:

Rotary selector switch	ICS
All mixer switches	OFF (down)
VOL control	Midrange

(5) Position the BC-376-H test oscillator outside on the ground approximately 15 feet from one side of the helicopter.

(6) Fully extend the BC-376-H antenna and place it parallel to the fore and aft axis of the helicopter.

(7) Energize the test oscillator and adjust according to instructions on the inside of the test oscillator's cover.

(8) On the test oscillator, position the modulation switch to 400 Hz and increase the rf output until the MARKER BEACON indicator light (green) just comes on and stays on. (MARKER BEACON SENSING switch positioned to HIGH). Marker beacon tone should be heard in headset at one of the interphone stations.

(9) On the instrument panel position the MARKER BEACON SENSING switch to LOW. MARKER BEACON indicator light should go out.

(10) On the test oscillator increase the rf output until the MARKER BEACON indicator light comes on. Reduce rf output to minimum.

(11) Position the modulation switch to 1300 Hz and repeat previous substeps (8) through (10).

(12) Position the modulation switch to 3000 Hz and repeat previous substeps (8) through (10) except do not reduce the rf output.

(13) At each interphone station listen for the marker beacon tone. Marker beacon tone (3000 Hz) should be heard clear, distinct, and of adequate volume.

(14) On the instrument panel, rotate the MARKER BEACON VOLUME control clockwise and counterclockwise. Volume level of tone signal heard in the headsets should increase and decrease respectively.

(15) On the test oscillator, reduce the rf output to minimum and turn off the test oscillator.

(16) On the instrument panel, rotate the MARKER BEACON VOLUME control/on-off switch to OFF (full counterclockwise position).

b. Radio Receiver R-1041/ARN (Marker Beacon) Facility Troubleshooting Chart.

Symptom	Probable cause	Corrective measures
1. MARKER BEACON indicator light does not light when press-to-test feature is actuated.	Defective lamp.	Replace defective lamp.
2. MARKER BEACON indicator light does not light with press-to-test feature nor when test oscillator is increased to maximum rf output.	Defective MARKER BEACON R-1041A circuit breaker.	Replace defective circuit breaker.
3. MARKER BEACON indicator light does not light under test oscillator simulation but does when press-to-test feature is actuated. No marker beacon tone heard in headsets.	*a.* Defective marker beacon antenna.	*a.* Place the test oscillator inside the helicopter and connect the rf output directly to the rf input of the marker beacon receiver. Increase the rf output of test oscillator while listening in headset at one of the interphone stations, and watching the MARKER BEACON indicator light. If audio tone is heard and MARKER BEACON indicator light comes on, replace defective marker beacon antenna.
	b. Defective marker beacon receiver.	*b.* If no audio tone is heard and MARKER BEACON indicator light does not come on, re-

Symptom	Probable cause	Corrective measures
		place marker beacon receiver.
4. MARKER BEACON indicator light does not light under test oscillator simulation but does when press-to-test feature is actuated. Marker beacon tone is heard in headsets.	Defective relay or rectifier circuits in marker beacon receiver.	Replace defective marker beacon receiver.
5. No marker beacon tone heard at any interphone station but MARKER BEACON indicator light operates normally.	*a.* Defective audio circuits in marker beacon receiver. *b.* Defective MARKER BEACON VOLUME control/on-off switch. *c.* Open marker beacon receiver audio wiring between marker beacon receiver connector P501 pin c and VOLUME control terminal 3 or between VOLUME control terminal 4 and TB20 terminal 8.	*a.* Replace defective marker beacon receiver. *b.* Replace defective switch unit. *c.* Make continuity checks of marker beacon receiver audio wiring. (See figure FO-11.) Repair or replace wiring as applicable.
6. No marker beacon tone heard at one of the interphone stations.	*a.* Defective headset, receiver audio amplifier in ICS control panel, or wiring between headsets and ICS control panel. *b.* Open marker beacon receiver audio wiring between ICS control panel connector pin HH and TB20 pin 8 or TB70 section 7 terminal F or G as applicable.	*a.* Refer to interphone facility troubleshooting, paragraph 3-6. *b.* Make continuity check of marker beacon receiver audio wiring. (See figure FO-3.) Repair or replace wiring as applicable.
7. MARKER BEACON indicator light remains lighted when MARKER BEACON SENSING switch is positioned to LOW. Volume level of marker beacon tone does not increase or decrease when MARKER BEACON VOLUME control/on-off switch is adjusted.	*a.* Defective MARKER BEACON SENSING switch. *b.* Defective sensing circuits in marker beacon receiver. Defective MARKER BEACON VOLUME control/on-off switch.	*a.* Replace defective switch. *b.* Replace defective marker beacon receiver. Replace defective switch unit.

3–15. Troubleshooting Radio Receiving Set AN/ARN-82 VHF Navigation (VOR) Facility

a. Facility Performance Test. The interphone facility's vor audio reception performance test is made in conjunction with the vhf navigation facility performance test.

NOTE

Signal generator SG-13/ARN or equivalent is required to perform the vhf navigation facility performance test.

(1) Ensure the VHF NAV ONMI, INTER COM PLT & CREW-R, INTER COM CPLT & CREW-L, and COURSE IND (on ac circuit breaker panel) circuit breakers are depressed and engaged.

(2) On the vhf navigation control panel, position the power switch to PWR and allow 3 minutes warmup time.

(3) On the ID-1347/ARN-82 course indicator, set the OBS control for a zero indication under course index.

(4) On the vhf navigation control panel, position the power switch to TEST. On the ID-1347/ARN-82 course indicator, the vor/localizer needle should center and the TO/FROM indicator should display FROM.

(5) Position the power switch to PWR and select a frequency of 109.00 MHz using the two frequency selector knobs. On the ID-1347/ARN-82 course indicator, the red LOC warning flag should be displayed.

(6) Position the signal generator, connected to a 21 to 29 vdc power source, near the helicopter and set the controls as follows:

(a) Set the METER switch to LINE and adjust the SET LINE TO 21V control until meter indicates 21 ±0.5 Vdc. Allow a 3-minute warmup time.

(b) Set the METER switch to B+. The meter should indicate 230 Vdc.

(c) Set the METER switch to CAR and turn the CARRIER SET control fully counterclockwise.

(d) Adjust the METER ZERO control for a zero indication on the meter. This adjustment is not critical.

(e) Set the NAV/GS switch to NAV.

(f) Set the MEGAHERTZ control for an indication of 108.00 MHz.

(g) Set the MICROVOLTS dial to 1K.

(h) Set the AUDIO SELECTOR control to VOR.

(i) Connect the signal generator antenna, fully extended, to the NAV OUTPUT connector on the signal generator.

(j) Set the LOC/GS control to the center position.

(k) Adjust the CARRIER SET control for a red line indication on the meter.

NOTE

The CARRIER SET control must be adjusted for a red line indication on the meter each time the frequency is changed.

(7) On the vhf navigation control panel, select a frequency of 108.00 MHz. On the ID-1347/ARN-82 course indicator, the red LOC warning flag should no longer be visible.

(8) On the signal generator position the VOR control to zero degrees.

(9) On the ID-1347/ARN-82 course indicator, adjust the OBS control to center the vertical pointer. The course card should indicate approximately zero degrees and the TO/FROM indicator should display TO.

NOTE

A reciprocal course may be displayed when the vertical pointer is centered. This is indicated by the compass card indication being the VOR control setting ±180 degrees and the TO/FROM indicator displaying FROM. Readjust the OBS control until the vertical pointer again centers and the TO/FROM indicator displays TO.

(10) Rotate the OBS control in on direction so that the course card rotates through 360 degrees. The vertical pointer should center at approximately 0 and 180 degrees and the TO/FROM indicator should change displays from TO to FROM and back to TO at approximately 45 and 270 degrees (course card indication). The No. 2 pointer on the ID-250A/ARN course indicator and the ID-998/ASN radio magnetic indicator should smoothly follow the rotation of the course card on the ID-1347/ARN-82 course indicator.

NOTE

The No. 2 pointer on the ID-250A/ARN course indicator and the ID-998/ASN radio magnetic indicator indicates only a relative bearing in relationship to the compass card. The bearing indication does not have to indicate the same number of degrees as the compass card but should follow the compass card degree indication in a fixed relationship.

(11) Repeat previous substeps (8) and (9) for VOR control settings of 45, 90, 135, 180, 225, 270, and 315 degrees. The course card on the course indicator should indicate approximately the same number of degrees as the VOR control setting on the signal generator.

(12) On the signal generator, position the AUDIO SELECTOR control to 1000- ~ and at each interphone station position the rotary selector switch to ICS and the VOL control to midrange. No audio tone should be heard in the headsets at any interphone station.

(13) At each interphone station one at a time, position the AUX mixer switch to AUX (up). An audio tone (1000 Hz) should be heard at each interphone station.

(14) On the vhf navigation control panel rotate the VOL control clockwise and counterclockwise. The audio tone volume level should increase and decrease, respectively, as heard in the headsets at one of the interphone stations.

(15) On the signal generator, select a frequency of 117.90 MHz and a heading of zero degrees (VOR control) and then red line the meter using the CARRIER SET control.

(16) On the vhf navigation control panel, select a frequency of 117.90 MHz.

(17) On the ID-1347/ARN-82 course indicator adjust the OBS control to center the vertical pointer with the course card indicating approximately zero degrees. The red LOC warning flag should not be visible and an audio tone (1000 Hz) should be heard in the headsets at one of the interphone stations.

(18) Repeat previous substeps (15) through (17) for frequency selections of 121.30 MHz and 126.90 MHz.

(19) On the signal generator, position the AUDIO SELECTOR control to TONE LOC, select a frequency of 110.10 MHz, and then red line the meter with the CARRIER SET control.

(20) On the vhf navigation control panel, select a frequency of 110.10 MHz.

(21) On the signal generator, rotate the MICROVOLTS dial clockwise until the red LOC warning flag on the ID-1347/ARN-82 course indicator disappears.

(22) On the signal generator, rotate the LOC/GS control over the range between the left sector's two engraved lines. The vertical pointer on the ID-1347/ARN-82 course indicator should deflect to the left.

(23) Rotate the LOC/GS control over the range between the right sector's two engraved lines. The vertical pointer on the course indicator should deflect to the right.

(24) Rotate the LOC/GS control to the white center sector. The vertical pointer on the course indicator should be centered.

(25) On the signal generator, rotate the MICROVOLTS dial fully counterclockwise and turn off the signal generator.

(26) On the vhf navigation control panel, position the power switch to OFF.

(27) At each interphone station, position the AUX mixer switch on the ICS control panel to OFF (down).

b. Radio Receiving Set AN/ARN-82 VHF Navigation (VOR) Facility Troubleshooting Chart.

Symptom	Probable cause	Corrective measures
1. Vor/localizer needle does not center nor does TO/FROM indicator display FROM when power switch on vhf navigation control panel is positioned to TEST.	*a.* Defective power switch on vhf navigation control panel. *b.* Defective test circuits in vhf navigation receiver. *c.* Defective VHF NAV OMNI circuit breaker.	*a.* Replace defective vhf navigation control panel. *b.* Replace defective vhf navigation receiver. *c.* Replace defective circuit breaker.
2. The red LOC warning flag on ID-1347/ARN-82 course indicator does not appear when signals are not being received.	LOC warning flag stuck in ID-1347/ARN-82 course indicator.	Replace defective course indicator.
3. The red LOC warning flag does not disappear but vertical pointer does deflect and center (signals being received).	*a.* Defective LOC warning flag in ID-1347/ARN-82 course indicator. *b.* Defective vhf navigation receiver. *c.* Defective contacts on relay K54.	*a.* Replace defective course indicator. *b.* Replace defective vhf navigation receiver. *c.* Replace defective relay.
4. The TO/FROM indicator on the ID-1347/ARN-82 course indicator will display TO but not FROM, or vice versa, or neither are displayed.	*a.* Defective vhf navigation receiver. *b.* Defective TO/FROM indicator in ID-1347/ARN-82 course indicator.	*a.* Replace defective vhf navigation receiver. *b.* Replace defective course indicator.
5. Vertical pointer on ID-1347/ARN-82 course indicator does not deflect right or left; remains centered at all times. The TO/FROM indicator operates correctly.	Defective vhf navigation receiver.	Replace defective vhf navigation receiver.
6. Vertical pointer on ID-1347/ARN-82 course indicator remains at center position throughout 180 degrees rotation of course card but will deflect to one side throughout the other 180 degrees rotation.	*a.* Defective ID-1347/ARN-82 course indicator. *b.* Defective vhf navigation receiver. *c.* Defective contacts on relay K53. *d.* Loose connections or damaged coaxial cable between vhf navigation receiver and the AS-1304/ARN antennas.	*a.* Replace defective course indicator. *b.* Replace defective vhf navigation receiver. *c.* Replace defective relay. *d.* Tighten all loose connections and replace damaged coaxial cable. (See figure FO-12.)

Symptom	Probable cause	Corrective measures
	e. Defective AS-1304/ARN antenna.	e. If vertical pointer will deflect right but not left, replace defective left antenna. If vertical pointer will deflect left but not right, replace defective right antenna.
7. The No. 2 pointer on both the ID-250A/ARN course indicator and the ID-998/ASN radio magnetic indicator does not rotate. Course card on ID-1347/ARN-82 course indicator operates correctly.	a. Defective vhf navigation receiver.	a. Replace defective vhf navigation receiver.
	b. Defective COURSE IND circuit breaker.	b. Make voltage test for +28 vdc at TB1 terminal 12 to ground. If voltage is not present, replace defective circuit breaker.
	c. Open vor wiring between vhf navigation receiver connector P306 pins H or K and TB1 terminals 7 or 6 respectively.	c. Make continuity checks of vor wiring. (See figure FO-12.) Repair or replace wiring as applicable.
8. The No. 2 pointer on the ID-250A/ARN course indicator or on the ID-998/ASN radio magnetic indicator (not both) does not follow the course card rotation on the ID-1347/ARN-82 course indicator.	Defective ID-250A/ARN course indicator or ID-998/ASN radio magnetic indicator as applicable.	Replace applicable defective indicator.
9. Audio signal heard at one of the interphone stations when AUX mixer switch is in the OFF (down) position.	Defective AUX mixer switch on ICS control panel.	Replace defective ICS control panel.
10. No audio tone heard at one interphone station when AUX mixer switch is positioned to AUX (up).	a. Defective headset, receiver audio amplifier in ICS control panel, or wiring between headsets and ICS control panel.	a. Refer to interphone facility troubleshooting, paragraph 3-6.
	b. Defective AUX mixer switch on ICS control panel.	b. Replace defective ICS control panel.
	c. Open vhf navigation audio wiring between ICS control panel connector pin UU and and TB19 terminal 7 or	c. Make continuity check of vhf navigation audio circuits. (See figure FO-3.)

Symptom	Probable cause	Corrective measures
	TB70 section 6 terminal D or E as applicable.	Repair or replace wiring as applicable.
11. No audio tone heard at any interphone station.	*a.* Defective vhf navigation receiver. *b.* Defective VOL control on vhf navigation control panel. *c.* Open vhf navigation audio circuits between vhf navigation receiver connector P304 pin L and vhf navigation control panel connector P311 pin b or between vhf navigation control panel connector P311 pin d and TB19 terminal 7.	*a.* Replace vhf navigation receiver. *b.* Replace vhf navigation control panel. *c.* Make continuity checks of vhf navigation audio circuits. (See figure FO-12.) Repair or replace wiring as applicable.
12. Vhf navigation audio is not adjustable using the VOL control on the vhf navigation control panel.	Defective VOL control on vhf navigation control panel.	Replace defective vhf navigation control panel.
13. The red LOC warning flag on the ID-1347/ARN-82 course indicator does not operate correctly and the audio tone is not heard when making the frequency checks.	*a.* Defective frequency selection circuits in the vhf navigation receiver. *b.* Defective frequency selection controls on vhf navigation control panel. *c.* Open frequency selection wiring between vhf navigation control panel connector P311 and vhf navigation receiver connector P304.	*a.* Replace defective vhf navigation receiver. *b.* Replace defective vhf navigation control panel. *c.* Make continuity checks of frequency selection wiring. (See figure FO-12.) Repair or replace wiring as applicable.
14. Vertical pointer and red LOC warning do not operate correctly when testing on localizer frequency 110.10 MHz.	Defective localizer circuits in vhf navigation receiver.	Replace defective vhf navigation receiver.

3–16. Troubleshooting Transponder Set AN/APX-72, Transponder (IFF) Facility

a. Facility Performance Test. The interphone facility's iff audio performance test is made in conjunction with the iff facility performance test.

NOTE

Test set AN/APM-123(V)1 and an attenuator (55 db at 25 watts) are required to perform the iff facility performance test.

(1) Install the test hood MX-4396/APM-123(V), supplied with the AN/APM-123(V)1 test set, over the aircraft iff antenna, AT-884( )/APX.

NOTE

Ensure that the test hood is seated correctly and tightly against the aircraft skin to prevent radiation of the rf signals. Emergency code 7600 identifies a communications failure and emergency code 7700 identifies an aircraft in distress. These signals must not be radiated during ramp testing.

(2) Connect the attenuator (55 db at 25 watts) to the test hood, then connect rf cable, CG-409G/U, between the attenuator and PROBE connector of the test set.

CAUTION

Failure to use the 55 db attenuator will seriously damage the test set.

(3) Ensure that MASTER switch on the iff transponder control panel and the POWER switch on the test set are positioned to OFF and that the PUSH TO TEST switch on the test set is rotated to the left away from LOCK.

(4) Apply power to the helicopter and to the test set.

NOTE

The test set operates on 115 vac at either 60 or 400 Hz, or, on 28 vdc.

(5) Ensure the two IFF APX-( ) circuit breakers and the INTER COM PLT & CREW-R and INTER COM CPLT & CREW-L circuit breakers are depressed and engaged.

(6) On iff transponder control panel, rotate the MASTER switch to STBY.

(7) On test set, position the POWER switch to 28 VDC ON or to 115 VAC ON, as appropriate. Allow 10 minutes for equipment warmup.

(8) On the test set, rotate the FUNCTION selector switch to SELF TEST and the MODE selector switch to 1; then depress the PUSH TO TEST switch. The ACCEPT light should light.

(9) Repeat previous substep (8) with the Mode selector switch positioned to 2, 3/A, and C (one at a time). The ACCEPT light should light for each test.

NOTE

The ACCEPT light on the test set indicates acceptable test set or transponder operation; the REJECT light indicates failure of either the test set or the transponder.

(10) On the test set, set controls as follows:

FUNCTION selector switch	SYSTEM
MODE selector switch	1
CODE selector switches	ϕϕϕϕ
ISLS switch	OFF

(11) On the iff transponder receiver-transmitter, position MODE 2 code dials to ϕϕϕϕ.

(12) On the iff transponder control panel, set controls as follows:

CODE selector switch	ZERO
AUDIO/OUT/LIGHT switch	OUT
M-1 toggle switch	ON
M-2 toggle switch	OUT
M-3/A toggle switch	OUT
M-C toggle switch	OUT
RAD TEST/OUT/MON switch	OUT
MODE 4 switch	OUT
MODE 1 code dials	ϕϕ
MODE 3/A code dials	ϕϕϕϕ
IDENT/OUT/MIC switch	OUT
MASTER selector switch	NORM

(13) On the test set, depress the PUSH TO TEST switch. The ACCEPT light should light.

(14) On the iff transponder control panel, position the MODE 1 code dials to 73.

(15) On test set, rotate CODE selector switches to 7300; then depress PUSH TO TEST switch. The ACCEPT light should light.

(16) On the iff transponder control panel, position controls as follows:

M-1 toggle switch	OUT
M-2 toggle switch	ON
MODE 1 code dials	ϕϕ

(17) On test set, rotate controls as follows:

MODE selector switch	2
CODE selector switches	ϕϕϕϕ

(18) On test set, depress PUSH TO TEST switch. The ACCEPT light should light.

(19) On the iff transponder receiver-transmitter, rotate the MODE 2 code dials to 7777.

(20) On the test set, rotate CODE selector switches to 7777, then depress PUSH TO TEST switch. The ACCEPT light should light.

(21) On the iff transponder control panel, position controls as follows:

M-2 toggle switch	OUT
MODE 3/A code dials	7777
M-3/A toggle switch	ON

(22) On the test set, rotate the MODE selector switch to 3/A; then depress PUSH TO TEST switch. The ACCEPT light should light.

(23) On the iff transponder control panel, position the MODE 3/A code dials to ϕϕϕϕ.

(24) On the test set, rotate the CODE selector switches to ϕϕϕϕ; then depress PUSH TO TEST switch. The ACCEPT light should light.

(25) On the test set, rotate the MODE selector switch to TEST.

(26) Simultaneously hold RAD TEST/OUT/MON switch on the iff transponder control panel to RAD TEST and depress the PUSH TO TEST switch on the test set. The ACCEPT light shall light.

(27) On the iff transponder control panel, position the MODE 3/A code dials to 7777.

(28) On the test set, rotate the CODE selector switches to 7777.

(29) Simultaneously hold RAD TEST/OUT/MON switch on the iff transponder control panel to RAD TEST and depress the PUSH TO TEST switch on the test set. The ACCEPT light should light.

(30) On the iff transponder receiver-transmitter, position the MODE 2 code dials to ϕϕϕϕ.

(31) On the test set, position switches as follows:

CODE selector switches	ϕϕϕϕ
FUNCTION selector switch	EMER
MODE selector switch	1

(32) On the iff transponder control panel, rotate the MASTER selector switch to EMER.

(33) On the test set, depress the PUSH TO TEST switch. The ACCEPT light should light.

(34) On the test set, rotate the MODE selector switch to 2; then depress the PUSH TO TEST switch. The ACCEPT light should light.

(35) On the test set, position controls as follows:

CODE selector switches	7700
MODE selector switch	3/A

(36) On the test set, depress the PUSH TO TEST switch. The ACCEPT light should light.

(37) On the iff transponder control panel, position the MODE 3/A code dials to any number; then depress the PUSH TO TEST switch on the test set. The ACCEPT light should light.

(38) Repeat substep (37) for two additional random code settings. The ACCEPT light should light each time the PUSH TO TEST switch is depressed.

(39) On the iff transponder control panel, position controls as follows:

M-1 toggle switch	ON
M-2 toggle switch	ON
M-3/A toggle switch	ON
M-C toggle switch	OUT
MODE 3/A code dials	ϕϕϕϕ
MASTER selector switch	NORM

(40) On the test set, position controls as follows:

FUNCTION selector switch	I/P
MODE selector switch	1
PUSH TO TEST switch	LOCK (depress and rotate)
CODE selector switches	ϕϕϕϕ

(41) On the iff transponder control panel, momentarily position the IDENT/OUT/MIC switch to IDENT. The ACCEPT light should light from 15 to 30 seconds.

(42) On the test set, rotate the MODE selector switch to 2.

(43) On the iff transponder control panel, momentarily position the IDENT/OUT/MIC switch to IDENT. The ACCEPT light should light from 15 to 30 seconds.

(44) On the test set, rotate the MODE selector switch to 3/A.

(45) On the iff transponder control panel, momentarily position the IDENT/OUT/MIC switch to IDENT. The ACCEPT light should light from 15 to 30 seconds.

(46) On the iff transponder control panel, position the AUDIO/OUT/LIGHT switch to AUDIO, then momentarily position the IDENT/OUT/MIC switch to IDENT. Iff audio should be present in headsets at all four interphone stations.

(47) On iff transponder control panel, position the AUDIO/OUT/LIGHT switch to OUT.

(48) On the test set, rotate the PUSH TO TEST switch to left and release upwards.

NOTE

The MIC position of the IDENT/OUT/MIC switch on the iff transponder control panel is disabled and no checks are made in the MIC position.

NOTE

If the Transponder Test Set, TS-1843( )/APX is installed in the helicopter, continue with this test. If the test set is not installed, testing is complete; power should be turned off and the test equipment removed from the helicopter.

(49) On the iff transponder control panel, position switches as follows:

MODE 1 code dials	Any code
MODE 3/A code dials	Any code
RAD TEST/OUT/MON switch	OUT

(50) On the iff transponder control panel, position and hold the M-1 toggle switch to TEST. The green TEST light on the iff transponder control panel should light. Release the M-1 toggle switch.

(51) On the iff transponder control panel, position and hold the M-2 toggle switch to TEST. The green TEST light on the iff transponder control panel should light. Release the M-2 toggle switch.

(52) On the iff transponder control panel, position and hold the M-3/A toggle switch to TEST. The green TEST light on the iff transponder control panel should light. Release the M-3/A toggle switch.

(53) On the test set, rotate the FUNCTION selector switch to SYSTEM.

(54) On the iff transponder control panel, position switches as follows:

M-2 toggle switch	OUT
M-3 toggle switch	OUT
RAD TEST/OUT/MON switch	OUT
MODE 1 code dials	33
MODE 3/A code dials	ϕϕϕϕ

NOTE

In the following step, the RAD TEST/OUT/MON switch is positioned to MON. Do not leave the switch in this position when not actually testing; return the switch to OUT.

(55) On the iff transponder control panel, position the RAD TEST/OUT/MON switch to MON.

(56) On the test set, depress the PUSH TO TEST switch. The ACCEPT light on the test set and the green TEST light on the iff transponder control panel should light simultaneously and the TEST light should remain lighted as long as the ACCEPT light is lighted. Release the PUSH TO TEST switch.

NOTE

The green TEST light may blink out momentarily at a slow steady rate. This is normal and does not indicate a failure, If the TEST light does not light, or flickers randomly, this indicates a failure.

(57) On the iff transponder control panel, position the RAD TEST/OUT/MON switch to RAD TEST. The green TEST light should not light.

(58) Position the MASTER selector switch on the iff transponder control panel to OFF and the POWER switch on the test set to OFF.

b. Transponder Set AN/APX-72 (IFF Transponder) Facility Troubleshooting Chart

Symptom	Probable cause	Corrective measures
1. No response to any test.	*a.* No input power.	*a.* Check power source and correct.
	b. Blown fuse in RT-859/APX-72 receiver-transmitter.	*b.* Replace blown fuse.
	c. Defective 10 amp circuit breaker (CB 17).	*c.* Check for 28 vdc at terminal board Tb19 terminal 1. If +28 vdc is not present, replace defective circuit breaker.
	d. Defective 5 amp circuit breaker (CB-18).	*d.* Check for 28 vdc at TS-1843/APX test set P918 pin 1. If +28 vdc is not present, replace defective circuit breaker.
	e. Defective rf cable between RT-859/APX-72 receiver-transmitter and TS-1843/APX test set.	*e.* Check rf cable and connections; tighten connectors or replace rf cable as necessary.

Sympton	Probable cause	Corrective measures
	f. Defective RT-859/APX-72 receiver-transmitter.	*f.* Replace defective iff receiver-transmitter.
	g. Defective C-6280/APX control panel.	*g.* Replace defective iff transponder control panel.
	h. Defective TS-1843/APX test set.	*h.* Replace defective TS-1843/APX test set.
	i. Defective interconnecting cable between C-6280/APX control panel, RT-859/APX-72 receiver-transmitter and TS-1843/APX test set.	*i.* Check interconnecting cable and connectors; repair or replace wiring as necessary.
2. No audio heard at one of the interphone stations; audio present at other station; other test indications are normal.	*a.* Defective headset, receiver audio amplifier in ICS control panel, or open wiring between headset and ICS control panel.	*a.* Refer to interphone facility troubleshooting, paragraph 3-6.
	b. Open iff audio wiring between ICS control panel connector pin FF and TB20 terminal 9 or TB70 section 7 terminal A or B as applicable.	*b.* Make continuity checks of iff audio wiring. (See figure FO-3.) Repair or replace wiring as applicable.
3. No audio heard at any interphone station; other test indications are normal.	*a.* Defective RT-859/APX-72 receiver-transmitter.	*a.* Replace defective iff receiver-trans mitter.
	b. Defective impedance matching network (A16).	*b.* Replace defective impedance matching network.
	c. Open iff audio circuit between iff receiver-transmitter connector P916 pin 9 and impedance matching network (A16) J600 pin 22 or J600 pin 22 and TB20 terminal 9.	*c.* Make continuity checks of iff audio circuits. (See figure FO-13.) Repair or replace wiring as applicable.
4. TEST light on C-6280/APX control panel fails to light; all other tests are normal.	*a.* Test light on C-6280/APX control panel burned out.	*a.* Replace burned out lamp.
	b. Defective C-6280/APX control panel.	*b.* Replace defective iff transponder control panel.
	c. Defective TS-1843/APX test set.	*c.* Replace defective TS-1843/APX-72 test set.

Symptom	Probable cause	Corrective measures
5. TEST light on C-6280/APX control panel responds normally; all other tests fail.	*a.* Rf cable between TS-1843/APX test set and antenna faulty.	*a.* Check rf cable; tighten connections or replace if necessary.
	b. Defective TS-1843/APX test set.	*b.* Replace defective TS-1843/APX test set.
	c. Defective AT-884/APX antenna.	*c.* Replace defective antenna.
	d. Improper hookup between MX-4396/APM-123 hood and APM-123 test set.	*d.* Check test setup; correct if necessary.
6. Interference in other helicopter radios or interphone systems.	*a.* Improper installation or hookup of MX-4396/APM-123 hood, attenuator, or cable to APM-123 test set.	*a.* Recheck and ensure proper mounting of hood, cable connections, and rf cable.
	b. Defective rf cables.	*b.* Check transponder rf cables; tighten connectors or replace as necessary.
	c. Defective RT-859/APX-72 receiver-transmitter.	*c.* Replace defective iff receiver-transmitter.
	d. Defective TS-1843/APX test set.	*d.* Replace defective TS-1843/APX test set.
	e. Defective interconnecting cables.	*e.* Inspect for broken or damaged wire shields and grounds; replace if necessary.
	f. Equipment receiving interference faulty.	*f.* Replace equipment receiving interference.
7. Tests involving MODE 2 code dials fail; all other tests normal.	*a.* Defective RT-859/APX-72 receiver-transmitter.	*a.* Replace defective iff receiver-transmitter.
	b. Defective C-6280/APX control panel.	*b.* Replace defective iff transponder control panel.
8. Test failures not identified above.	*a.* Procedures or switch settings incorrect.	*a.* Check procedures and switch settings.
	b. Low helicopter bus voltage.	*b.* Adjust bus voltage to 28 vdc. (Refer to TM 55-1520-210-20.)
	c. RF cables defective.	*c.* Check rf cables; tighten connections or replace rf cables, if necessary.

Symptom	Probable cause	Corrective measures
	d. Defective RT-859/APX-72 receiver-transmitter.	d. Replace defective iff receiver-transmitter.
	e. Defective C-6280/APX control panel.	e. Replace defective iff transponder control panel.
	f. Defective TS-1843/APX test set.	f. Replace defective TS-1843/APX test set.
	g. Defective interconnecting cables between C-6820/APX control panel, RT-859/APX receiver-transmitter, and TS-1843 test set.	g. Check interconnecting cables, replace defective cables.
	h. Defective antenna.	h. Replace defective antenna.

3-16.1. Troubleshooting Receiver, Radio R-1963/ARN(Glideslope/Marker Beacon) Facility

a. Glideslope Performance Test

NOTE

Signal generator SG-13 is required to perform the operational check of the glideslope.

(1) Depress the R-1963 and VHF NAV OMNI circuit breakers on the dc circuit breaker panel.

(2) Energize main inverter.

(3) Set C-6873B/ARN-82 power switch to PWR.

NOTE

The following is a list of localizer frequencies (NAV-COMM omni control panel settings) and their associated glideslope frequencies. All frequencies are given in MegaHertz.

Localizer Frequency	*Glideslope Frequency*
108.10	334.7
108.30	334.1
108.50	329.9
108.70	330.5
108.90	331.4
109.10	331.4
109.30	332.0
109.50	332.6
109.70	332.2
109.90	333.8
110.10	333.4
110.30	335.0
110.50	329.6
110.70	330.2
110.90	330.8
111.10	331.7
111.30	332.3
111.50	332.9
111.70	333.5
111.90	333.1

(4) With the SET LINE TO 21V control OFF, connect the SG-13/ARN to a 21 to 29 volt dc portable power source.

(5) Set METER switch to LINE.

(6) Rotate SET LINE TO 21V control for 21 ± 0.5 volts on meter.

(7) Set the MEGACYCLES control to 109.30 (332.00 MHz), and set receiver frequency (in aircraft) to 109.30.

(8) Set AUDIO SELECTOR switch to GLIDESLOPE.

(9) Set NAV GS switch to GS.

(10) Set MICROVOLTS control to 1K microvolts.

(11) Set METER switch to CAR.

(12) Adjust CARRIER SET control for red-line indication on meter.

(13) Set LOC-GS switch to Down.

(14) Position the SG-13/ARN directly in front of the aircraft center and move towards the aircraft until the glideslope warning flag is driven out of view.

(15) Set MICROVOLTS control to 10K microvolts.

(16) Set LOC-GS control to center (white line).

(17) The glideslope deviation pointer in the aircraft shall be within the center donut.

(18) Set LOC-GS control to UP.

(19) The glideslope deviation pointer in the aircraft shall deflect upward.

(20) Set LOC-GS control to DOWN.

(21) The glideslope deviation pointer in the aircraft shall deflect downward.

b. Receiver, Radio R-1963/ARN (Glidescope Section) Facility Troubleshooting Chart

Symptom	Probable cause	Corrective measures
1. The red GS warning flag on the ID-1347C/ARN-82 course indicator does not appear when signals are not being received.	GS warning flag stuck in ID-1347C/ARN-82 course indicator	Replace defective course indicator.
2. The red GS warning flag does not disappear but the horizontal pointer does deflect and center when signals are received.	a. Defective GS flag in ID-1347C/ARN-82 course indicator. b. Defective R-1963/ARN receiver. c. Defective contacts on relay K54.	a. Replace defective course indicator. b. Replace defective R-1963 receiver. c. Replace defective relay.

Symptom	Probable cause	Corrective measures
3. The red GS warning flag on the ID-1347C/ARN-82 course indicator disappears but the horizontal pointer does not deflect when signals are received.	a. Defective ID-1347C/ARN-82 course indicator. b. Defective R-1963 receiver. c. Defective contacts on relay K53.	a. Replace course indicator ID-1347C/ARN-82. b. Replace receiver. c. Replace relay.
4. The red GS warning flag on the ID-1347C/ARN-82 course indicator remains in view and the horizontal pointer does not deflect when signals are being received.	a. Defective R-1963 or AN/ARN-82 circuit breakers. b. Defective R-1963 receiver. c. Defective glideslope antenna or cabling. d. Defective control panel C-6873B/ARN-82.	a. Replace defective circuit breakers. b. Replace defective R-1963 receiver. c. Replace defective glideslope antenna or cabling as required. d. Replace defective control panel.

c. Marker Beacon Performance Test. The interphone facility's marker beacon reception performance test is made in conjunction with the marker beacon facility performance test.

NOTE

Test set BC-376 is required to perform the marker beacon facility performance test.

(1) Ensure the VHF-NAV OMNI, INTER COM PLT & CREW-R, R-1963, and INTER COM CPLT & CREW-L circuit breakers are depressed and engaged. Set C-6873B/ARN-82 power switch to PWR.

(2) On the instrument panel, position the MARKER BEACON controls as follows and allow at least 1 minute warmup time.

VOLUME control/on-off switch	Midrange
SENSING switch	High

(3) Depress the MARKER BEACON press-to-test indicator light. MARKER BEACON indicator light should light when depressed and go out when released.

(4) On each ICS control panel, position the controls as follows:

Rotary selector switch	ICS
All mixer switches	OFF (down)
VOL control	Midrange

(5) Place the BC-376, with its antenna fully extended, 10 to 20 feet from the helicopter. A headset can be used to monitor the marker beacon audio output.

(6) Turn the BC-376 on and move it toward the receiver antenna until a signal is heard in the headset.

(7) On the test oscillator, position the modulation switch to 400 Hz and increase the rf output until the MARKER BEACON indicator light just comes on and stays on. (MARKER BEACON SENSING switch positioned to HIGH.) Marker beacon tone should be heard in headset at one of the interphone stations.

(8) On the instrument panel, position the MARKER BEACON SENSING switch to LOW. MARKER BEACON indicator light should go out.

(9) On the test oscillator, increase the rf output until the MARKER BEACON indicator light comes on. Reduce rf output to minimum.

(10) Position the modulation switch to 1300 Hz and report previous substeps (7) through (9).

(11) Position the modulation switch to 3000 Hz and repeat previous substeps (7) through (9) except do not reduce the rf output.

(12) At each interphone station, listen for the marker beacon tone. Marker beacon tone (3000 Hz) should be heard clear, distinct, and of adequate volume.

(13) On the instrument panel, rotate the MARKER BEACON VOLUME control clockwise and counterclockwise. Volume level of tone signal heard in the headsets should increase and decrease respectively.

(14) On the test oscillator, reduce the rf output to minimum and turn off the test oscillator.

(15) On the instrument panel, rotate the MARKER BEACON VOLUME control/on-off switch to OFF (full counterclockwise position).

d. Radio Receiver R-1963/ARN (Marker Beacon) Facility Troubleshooting Chart

Symptom	Probable cause	Corrective measures
1. MARKER BEACON indicator light does not light when press-to-test feature is actuated.	Defective lamp.	Replace defective lamp.
2. MARKER BEACON indicator light does not light with press-to-test feature nor when test oscillator is increased to maximum rf output.	Defective R-1963 or VHF NAV OMNI circuit breaker.	Replace defective circuit breaker.
3. MARKER BEACON indicator light does not light under test oscillator simulation but does when press-to-test feature is actuated. No marker beacon tone is heard in headsets.	a. Defective marker beacon antenna AT-640/ARN.	a. Place the test oscillator inside the helicopter and connect the rf output directly to the rf input of the marker beacon receiver. Increase the rf output of test oscillator while listening in head-

Symptom	Probable cause	Corrective measures
		set at one of the interphone stations and watching the MARKER BEACON indicator light. If audio tone is heard and MARKER BEACON indicator light comes on, replace defective marker beacon antenna.
	b. Defective marker beacon section of R-1963/ARN receiver.	*b.* If no audio tone is heard and MARKER BEACON indicator light does not come on, replace receiver.
4. MARKER BEACON indicator light does not light under test oscillator simulation but does when press-to-test feature is actuated. Marker beacon tone is heard in headsets.	Defective circuits in marker beacon section of R-1963/ARN receiver.	Replace defective receiver.
5. No marker beacon tone heard but MARKER BEACON indicator light operates normally.	*a.* Defective audio circuits in marker beacon section of R-1963/ARN receiver.	*a.* Replace defective receiver.
	b. Defective MARKER BEACON VOLUME control/on-off switch.	*b.* Replace defective switch unit.
	c. Open marker beacon receiver audio wiring between marker beacon receiver connector P1 pin 7 and VOLUME control terminal 3 or between VOLUME control terminal 4 and TB20 terminal 8.	*c.* Make continuity checks of marker beacon receiver audio wiring. (See TM 11-1520-210-20.) Repair or replace wiring as applicable.
6. No marker beacon tone heard at one of the interphone stations.	*a.* Defective headset, receiver audio amplifier in ICS control panel, or wiring between headsets and ICS control panel.	*a.* Refer to interphone facility troubleshooting, paragraph 3-6.
	b. Open marker beacon receiver audio wiring between ICS control panel connector pin 18 and TB20 pin 8.	*b.* Make continuity check of receiver audio wiring. (See TM 11-1520-210-20.) Repair or replace wiring as applicable.
7. MARKER BEACON indicator light remains lighted when MARKER BEACON SENSING switch is positioned to LOW. Volume level of marker beacon tone does not increase or decrease when MARKER BEACON VOLUME control/on-off switch is adjusted.	*a.* Defective MARKER BEACON SENSING switch.	*a.* Replace defective switch.
	b. Defective sensing circuits in marker beacon section of receiver. Defective MARKER BEACON VOLUME control/on-off switch.	*b.* Replace defective receiver. Replace defective switch unit.

3-16.2. Troubleshooting Radio Receiving Set AN/ARN-123(V) (VOR/ILS) Facility

Refer to TM 11-1520-210-20-1 for performance test and troubleshooting procedures.

3-16.3. Troubleshooting Altimeter Set, Electronic AN/APN-209 (Radar Altimeter) Facility

a. Facility Performance Test.

(1) Depress the RADAR ALTM, INST PANEL LIGHTS, PILOT 5 VOLT LIGHTS and COPILOT 5 VOLT LIGHTS circuit breakers. Set PILOT INST LTG rheostat to OFF.

NOTE

The following procedures apply to both indicators, Receiver-Transmitter RT-1115/APN-209 (IRT) and Remote Height Indicator ID-1917/APN-209 (RI). System power can be controlled by the LO SET control knob on either the IRT or RI.

(2) Rotate the LO SET knob clockwise from OFF position until LO altitude index reads 0 feet. The indicator pointers will be driven behind the dial mask above 1500 feet. The OFF flag will remain in view and the digital display and warning lamps on the indicator will not be illuminated. The lamps and digital display may flash momentarily when power is first applied. Set the LO altitude index to 100 feet.

(3) Both units will indicate a track condition within two minutes from the time the unit is turned on. Track indications will be as follows:

(a) OFF flag not in view.
(b) Indicator pointer reading, 0 ± 5 feet.
(c) Digital display reading, −0, or 0 to 3 feet.
(d) LO warning lamp lighted.
(e) HI warning lamp not lighted.

NOTE

If necessary, a pointer or digital display zero adjustment may be made after the equipment stabilizes. These adjustments may be made with a jeweler's screwdriver through the small holes in the right side of the IRT. The upper hole is for pointer adjustment. The lower hole is for digital display adjustment.

(4) Set the HI altitude index to 800 feet. Depress and hold the HI set knob to activate the push-to-test function. The indicator pointer will read 1000 ± 100 feet. The digital display will read 1000 ± 100 feet. The HI warning lamp will be lighted and the LO warning lamp off.

(5) Release the HI SET knob. The indicators will return to the track conditions in step (3).

(6) Dimming tests.

(a) Set the LO altitude index to 100 feet, and set the output of the 5-volt supply to zero volt (open circuit breaker). Reduce dimming control and verify that both the digital display and the LO warning lamp dims. Both displays should be barely visible. Shade the front indicator if necessary to verify that the displays are still lighted.

(b) Rotate pilot instrument light rheostat to OFF position. An audible "click" should be heard from relay K100. Both displays should be fully illuminated.

(c) Energize 5-volt circuit breakers.

(d) Rotate instrument light rheostat slowly, fully clockwise, while observing the face of the indicators. The dials will be evenly lit as voltage is increased. Verify that at least one bulb (integral lighting) is lit in each upper corner of the displays.

b. Radar Altimeter Set AN/APN-209 Facility Troubleshooting Chart.

Symptom	Probable cause	Corrective measures
	NOTE The AN/APN-209 Electronic Altimeter Set is covered by a manufacturer's warranty and should be returned to the manufacturer for any repairs in accordance with the latest issue of SB 11-642 for this equipment. Prior to the warranty expiration, any attempt to repair the AN/APN-209 by anyone other than the manufacturer is unauthorized and will void the warranty.	
1. RADAR ALTM circuit breaker will not stay in.	a. Defective indicator. b. Defective circuit breaker. c. Defective wiring.	a. Replace indicator. b. Replace circuit breaker. c. Check and repair wiring.
2. The OFF flag remains in view.	a. Defective indicator. b. Loss of electrical power. c. Defective circuit breaker. d. Defective wiring.	a. Replace indicator. b. Check for 28 volt dc at pin 9 of P1 (IRT) and pin 1 of P1 (RI). c. Replace circuit breaker. d. Check and repair wiring. (See Figure FO-14.)
3. LO warning lamp fails to illuminate when indicated altitude is below LO altitude index.	Defective indicator.	Replace indicator.
4. When HI SET knob is depressed, the indicator pointer fails to indicate properly.	Defective indicator.	Replace indicator.
5. HI warning lamp fails to illuminate when indicated altitude is above HI altitude index.	Defective indicator.	Replace indicator.
6. Known altitude is not indicated by indicator pointer and digital display.	a. Defective indicator. b. Defective antenna.	a. Replace indicator. b. Replace antenna.

3-17. Terminal Board Voltage Measurements

a. Charts for all terminal boards that are interconnected with the electronic avionic systems are provided as an aid to troubleshooting. Only those terminals on each terminal board that are actually interconnected to the electronic avionic systems are listed. The charts list the primary electronic facility with which the terminal is interconnected, the function of the signal or voltage present, the operation of specific equipment(s) required to have the signal or voltage present at the terminal, and the signal or actual voltage value that should be present at the terminal under the conditions stated in the operation of equipment column. All voltage values of dc and ac voltages are given where possible. Audio, synchro, and variable dc voltages are only indicated since the values are dependent upon other variable factors.

The location of each terminal board is also listed with the title and is shown in TM 11-1520-210-20-1. The terminal board number and the primary electronic facility or function associated with the terminal board is listed as the title of each terminal board chart.

b. The terminal board number, primary electronic facility or function associated with the terminal board, and location are provided at the beginning of each chart. The physical location in relationship to the helicopter is shown in TM 11-1520-210-20-1. The charts are arranged in numerical order for quick reference capability.

c. If a trouble develops in an electronic facility and the performance test procedures and troubleshooting charts do not indicate the source of trouble, refer to the following charts and check for the voltages or signals listed at the applicable terminals associated with the electronic facility. If the measured voltage or signal is not as specified for the specific terminal, refer to the master wiring diagram in TM 11-1520-210-20-1 and trace the wiring to the power source, basic signal equipment, or installation item to locate the fault.

a. TB1, VOR and ADF (Located forward of pedestal)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
6	ARN-82 (VOR) and ID-988 (Pilot course indicator) and ID-250A (Copilot course indicator)	Stator Y error voltage from ARN-82 receiver P306 pin K to ID-988 indicator P403 pin 30 and to ID-250A indicator P-409 pin U	VOR (ARN-82) turned on	400 Hz error signal, 26 volt maximum

Terminal	Facility	Terminal function	Operation of equipment	Voltage
7	ARN-82 (VOR) and ID-988 (Pilot course indicator) and ID-250A (Copilot course indicator)	Stator X error voltage ARN-82 receiver P306 pin H to ID-988 indicator P403 pin 29 and to ID-250A indicator P409 pin T	VOR (ARN-82) turned on	400 Hz error signal; 26 volt maximum
8	ARN-83 (LF-ADF) and ID-998 (Pilot course indicator)	Stator Y error voltage from ARN-83 receiver P407 pin 19 to ID-998	LF-ADF (ARN-83) turned on	400 Hz error signal; 26 volt maximum
9	ARN-83 (LF-ADF) and ID-998 (Pilot course indicator)	Stator X error voltage from ARN-83 receiver P407 pin 20 to ID-998 indicator P403 pin 22	LF-ADF (ARN-83) turned on	400 Hz error signal; 26 volt maximum
12	ARN-82 (VOR) and ID-988 (Pilot course indicator) and ID-250A (Copilot course indicator)	Primary power from COURSE IND circuit breaker (CB98) on ac circuit breaker panel to ARN-82 receiver P306 pin G and to ID-988 indicator P403 pins 16, 21, and 34 and to ID-250A indicator P409 pins S and V	COURSE IND circuit breaker (CB98) on ac circuit breaker panel depressed	26 vac, 400 Hz

b. TB10, Gyromagnetic compass (Located in aft radio compartment)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
1	ASN-43 (Gyromagnetic compass)	Primary power from GYRO CMPS circuit breaker (CB88) to ASN-43 directional gyro P411 pins C and L	GYRO CMPS circuit breaker (CB88) on ac circuit breaker panel depressed	115 vac 400 Hz
2	ASN-43 (Gyromagnetic compass)	Primary power from GYRO CMPS circuit breaker (CB88) to ASN-43 directional gyro P411 pins R and V	GYRO CMPS circuit breaker (CB88) on ac circuit breaker panel depressed	115 vac 400 Hz
3	None	Not used	Not used	

Terminal	Facility	Terminal function	Operation of equipment	Voltage
4	ASN-43 (Gyromagnetic compass)	Ac ground to ASN-43 directional gyro P411 pins K and U	Not applicable	Ground
5	ASN-43 (Gyromagnetic compass)	AC ground to ASN-43 directional gyro P411 pins A and T	Not applicable	Ground
6	ASN-43 (Gyromagnetic compass)	Ac ground to ASN-43 directional gyro P411 pin S and to tail boom disconnect P410 pin D	Not applicable	Ground
7	ASN-43 (Gyromagnetic compass)	Ac ground to ASN-43 directional gyro P411 pin Z	Not applicable	Ground

c. TB12, Panel lights (Located in pedestal)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
1	ARN-83 (LF-ADF) and ARC-51 (UHF) ai ARC-54 (No. 1 fr liaison)	Panel light power from pedestal light control dimmer to ARN-83 control panel P302 pins G and b and to ARC-51 control panel P3801 pin P and to ARC-54 control panel P2107 pin a	Rotation of pedestal light control dimmer	Minimum to +28 vdc
2	KY-28 (Voice security) and interphone control panels	Panel light power from pedestal light control dimmer to KY-28 control panel and to copilot ICS control panel P3809 pin U and to pilot ICS control panel P3810 pin U and to left and right crew terminal board TB64 terminal 14	Rotation of pedestal light control dimmer	Minimum to +28 vdc
3	ARC-114 (No. 2 fm liaison) and ARC-115 (VHF-AM) and ARN-82 (VOR) and APX-72 (IFF)	Panel light power from pedestal light control dimmer to ARC-114 receiver-transmitter P3302 pin C and to ARC-115 receiver-transmitter P3201 pin C and to ARN-82 control panel P311 pin H and to APX-72 control panel P917 pin 12	Rotation of pedestal light control dimmer	Minimum to +28 vdc

d. TB19, Interphone (Located in communications junction box on back of pedestal)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
1	APX-72 (IFF)	Primary power from 10 ampere IFF AUX-( ) circuit breaker (CB17) to iff CODE HOLD switch terminal Z and to iff MODE 4 light terminal 3 and to iff control panel P917 pin 51	10 ampere IFF APX-( ) circuit breaker (CB17) on dc circuit breaker panel depressed	+28 vdc
3	ARN-83 (LF-ADF)	Audio out from impedance matching network J600 pin V to copilot ICS control P3809 pin WW and to pilot ICS control P3810 pin WW and to left and right crew TB63 pin 7	ARN-83 (LF-ADF) turned on and tuned to a signal	Audio hi
4	ARC-54 (No. 1 fm liaison)	Transmit control from copilot ICS control P3809 pin W and from pilot ICS control P3810 pin W and from left or right crew TB63 pin 8 to ARC-54 control panel P2107 pin q	Interphone facility turned on and radio No. 1 (ARC-54) selected and keyed	+28 vdc until radio No. 1 keyed; then ground
5	ARC-54 (No. 1 fm liaison)	Primary power from FM ARC-54 circuit breaker (CB31) to ARC-54 control panel P2107 pins C, D, and E	FM ARC-54 circuit breaker (CB31) on dc circuit breaker depressed	+28 vdc
6	ARN-82 (VOR)	Chassis ground from terminal board TB66 pin 2 to ARN-82 control panel P311 pin e	Not applicable	Ground
7	ARN-82 (VOR)	Audio from ARN-82 control panel P311 pin d to copilot ICS control P3809 pin UU and to pilot ICS control P3810 pin UU and to left and right crew TB63 pin 6	ARN-82 (VOR) turned on and tuned to a signal	Audio hi

Terminal	Facility	Terminal function	Operation of equipment	Voltage
8	ARC-102 (HF SSB)	Transmit control from audio threshold set P3304 pin G to ARC-102 control panel P1808 pins k and m	Interphone facility turned on and radio No. 4 (ARC-102) selected and keyed	+28 vdc until radio No. 4 keyed; then ground

e. TB20, Interphone (Located in communications junction box on back of pedestal)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
1	Interphone	Chassis ground from terminal board TB66 terminal 2 to audio threshold detector P3303 pin Y	Not applicable	Ground
2	ARC-51 (UHF)	Audio out from copilot ICS control panel P3809 pin R or from pilot ICS control panel P3810 pin R or from left or right crew terminal board TB 64 terminal 3 to audio threshold detector P3303 pin E	Interphone facility turned on and radio No. 2 (ARC-51) selected and keyed	Audio hi
3	ARC-51 (UHF)	Audio from A16 impedance matching network J600 pin b to copilot ICS control panel P3809 pin SS and to pilot ICS control panel P3810 pin SS and to left and right crew terminal board TB 63 terminal 2	Radio No. 2 (ARC-51) turned on and tuned to a signal	Audio hi
4	ARC-54 (No. 1 fm liaison)	Audio from copilot ICS control panel P3809 pin V or from pilot ICS control panel P3810 pin V or from left or right crew terminal board TB 64 terminal 2 to P421 pin A; then to ARC-54 control if KY-28 not installed, or KY-28 if installed	Interphone facility turned on and radio No. 1 (ARC-54) selected and keyed	Audio hi

Terminal	Facility	Terminal function	Operation of equipment	Voltage
5	ARC-115 (VHF-AM)	Audio from copilot ICS control panel P3809 pin L or from pilot ICS control panel P3810 pin L or from left or right crew terminal board TB64 terminal 5 to audio threshold detector P3303 pin C	Interphone facility turned on and radio No. 3 selected and keyed	Audio hi
6	ARC-102 (HF SSB)	Audio from copilot ICS control panel P3809 pin F or from pilot ICS control panel P3810 pin F or from left or right crew terminal board TB64 terminal 5 to audio threshold detector P3303 pin N	Interphone facility turned on and radio No. 4 (ARC-102) selected and keyed	Audio hi
7	ARC-114 (No. 2 fm liaison)	Audio from copilot ICS control panel P3809 pin P or from pilot ICS control panel P3810 pin P or from left or right crew terminal board TB64 terminal 6 to audio threshold detector P3303 pin L	Interphone facility turned on and radio No. 5 (ARC-114) selected and keyed	Audio hi
8	R-1041A (Marker beacon receiver)	Audio from R-1041A marker beacon receiver J506 pin R to copilot ICS control panel P3809 pin HH and to pilot ICS control panel P3810 pin HH and to left and right crew terminal board TB63 terminal 9	R-1041A (Marker beacon receiver) turned on and a signal available	Audio hi
9	APX-72 (IFF)	Audio from A16 impedance matching network J600 pin 22 to copilot ICS control panel P3809 pin FF and to pilot ICS control panel P3810 pin FF and to left and right crew terminal board TB63 terminal 8	APX-72 (IFF) turned on and transponder ramp test set operating	Audio hi
10	ARC-115 (VHF-AM)	Audio from A16 impedance matching network J600 pin 27 to copilot ICS control	Radio No. 3 (ARC-115) turned on	Audio hi

Terminal	Facility	Terminal function	Operation of equipment	Voltage
		panel P3809 pin PP and to pilot ICS control panel P3810 pin PP and to left and right crew terminal board TB63 terminal 3	and tuned to a signal	
11	ARC-102 (HF SSB)	Audio from A16 impedance matching network J600 pin W to copilot ICS control panel P3809 pin MM and to pilot ICS control panel P3810 pin MM and to left and right crew terminal board TB63 terminal 4	Radio No. 4 (ARC-102) turned on and tuned to a signal	Audio hi
12	ARC-114 (No. 2 fm liaison)	Audio from A16 impedance matching network J600 pin d to copilot ICS control panel P3809 pin EE and to pilot ICS control panel P3810 pin EE and to left and right crew terminal board TB63 terminal 5	Radio No. 5 (ARC-114) turned on and tuned to a signal	Audio hi
14	Interphone	Interphone audio between copilot ICS control panel P3809 pin DD and pilot ICS control panel P3810 pin DD and left and right crew terminal board TB64 terminal 7, and to A16 impedance matching network J600 pin 25	Interphone facility	

f. TB22, Copilot headset (Located in roof)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
1	Interphone	Headset lo from copilot ICS control panel P3809 pin XX to copilot headset J308L (black wire)	Interphone facility turned on and audio available and selected from any radio or from ICS	Audio lo

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Terminal	Facility	Terminal function	Operation of equipment	Voltage
2	Interphone	Headset hi from copilot ICS control panel P3809 pin TT to copilot headset J308L (white wire)	Interphone facility turned on and audio available and selected from any radio or from ICS	Audio hi
3	Interphone	Mic hi from copilot headset J308 L (red wire) to copilot ICS control panel P3809 pin C	Audio from copilot	Audio hi
4	Interphone	Mic lo from copilot headset J308 L (green wire) to copilot OCS control panel P3809 pin A	Audio from copilot	Audio lo
5	Interphone	Mic shield from copilot ICS control P3809 pin D to copilot headset J308 L	Copilot ICS control panel installed	Ground

g. TB23, Pilot headset (Located in roof)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
1	Interphone	Headset lo from pilot ICS control panel P3810 pin XX to pilot headset J308 R (black wire)	Interphone facility turned on and audio available and selected from any radio or from ICS	Audio lo
2	Interphone	Headset hi from pilot ICS control panel P3810 pin TT to pilot headset J308 R (white wire)	Interphone facility turned on and audio available and selected from any radio or from ICS	Audio hi

Terminal	Facility	Terminal function	Operation of equipment	Voltage
3	Interphone	Mic hi from pilot headset J308 R (red wire) to pilot ICS control panel P3810 pin C	Audio from pilot	Audio hi
4	Interphone	Mic lo from pilot headset J308 R (green wire) to pilot ICS control panel P3810 pin A	Audio from pilot	Audio lo
5	Interphone	Mic shield from pilot ICS control panel P3810 pin D to pilot headset J308 R	Pilot ICS control panel installed	Ground

h. TB26, Audio and dc grounds (Located in pedestal)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
1	ARC-114 (No. 2 fm liaison) and audio threshold detector	Ground to audio threshold detector P3303 pin b and to ARC-114 receiver-transmitter P3302 pin e and to shields of wires at P3302 pins H, K, X, Y, Z, d, and e	Not applicable	Ground
2	ARC-54 (No. 1 fm liaison) and audio threshold detector	Ground to audio threshold detector P3303 pin K and to ARC-54 control panel P2107 pins PP and w and to shields of wires at P2107 pins PP and w	Not applicable	Ground
3	ARC-51 (UHF) and R-1041A (marker beacon receiver) and audio threshold detector	Ground to audio threshold detector P3303 pin c and P3304 pin P and to ARC-51 receiver-transmitter P1403 pin U and to R-1041A receiver P501 pin b	Not applicable	Ground
4	ARC-114 (No. 2 fm liaison) and ARC-115 (VHF-AM)	Ground to ARC-114 receiver-transmitter P3302 pins E and P and to ARC-115 receiver P3201 pins E and P	Not applicable	Ground
5	ARN-83 (LF-ADF) and Interphone	Ground to ARN-83 receiver P407 pin 36 and to ARN-83 control panel P302 pins M and a and	Not applicable	Ground

Terminal	Facility	Terminal function	Operation of equipment	Voltage
		to shields of wires at P302 pins T, U, V, W, f, g, and h and to pilot foot switch terminal G		
6	APX-72 (IFF) and ARC-51 (UHF) and ARC-102 (HF SSB)	Ground to APX-72 control panel P917 pin 34 and to ARC-51 control panel P3801 pin N and to ARC-102 control panel P1808 pin e	Not applicable	Ground
7	ARC-54 (No. 1 fm liaison) and KY-28 (Voice security set) and APX-72 (IFF)	Ground to ARC-54 control panel P2107 pin b and to KY-28 control panel P423 pin E and to APX-72 computer P921 pin 34	Not applicable	Ground
8	APX-72 (IFF)	Ground to APX-72 transponder test set P918 pin 2 and to APX-72 control panel P917 pins 31 and 53 and to wire shields at P917 and to wire shields at APX-72 receiver transmitter P916	Not applicable	Ground
9	ARC-102 (HF SSB) and Interphone	Ground to ARC-102 control panel P1808 pin r and to copilot footswitch S61 terminal G	Not applicable	Ground
10	ARN-83 (LF-ADF) and ARN-82 (VOR)	Ground to ARN-83 receiver P407 pins 16 and 17 and to ARN-82 receiver P304 pin X and to ARN-82 control panel P311 pin h and to wire shields at P311 pins b, c, d, and e	Not applicable	Ground
11	Grounds	Grounds to other systems	Not applicable	Ground

i. TB44, HF-SSB (Located in aft radio compartment)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
1	ARC-102 (HF SSB)	Primary power from HF ARC-102 circuit breaker (CB34) to ARC-102	HF ARC-102 circuit breaker	+28 vdc

Terminal	Facility	Terminal function	Operation of equipment	Voltage
		receiver-transmitter P1806 pin 17	(CB34) on dc circuit breaker panel de-pressed	
2	ARC-102 (HF SSB)	Primary power from HF ARC-102 circuit breaker (CB34) to ARC-102 receiver-transmitter P1806 pins 1, 3 and 15	HF ARC-102 circuit breaker (CB34) on dc circuit breaker panel de-pressed	+28 vdc
3	ARC-102 (HF SSB)	Primary power from HF ARC-102 circuit breaker (CB34) to ARC-102 receiver-transmitter P1806 pins 2, 13, and 14	HF ARC-102 circuit breaker (CB34) on dc circuit breaker panel de-pressed	+28 vdc
4	ARC-102 (HF SSB)	Primary power from HF ARC-102 circuit breaker (CB34) to terminal board TB44 terminals 1, 2, and 3	HF ARC-102 circuit breaker (CB34) on dc circuit breaker panel de-pressed	+28 vdc
5	ARC-102 (HF SSB)	Primary power from ARC-102 HF STATIC INVTR circuit breaker (CB36) to ARC-102 inverter P1809 pins 2 and 3	ARC-102 HF STATIC INVTR circuit breaker (CB36) on dc circuit breaker panel de-pressed	
6	ARC-102 (HF SSB)	Primary power from HF ANT COUPLER circuit breaker (CB36) to ARC-102 receiver-transmitter P1806 pins 4 and 16	HF ANT COUPLER circuit breaker (CB36) on dc circuit breaker panel de-pressed	+28 vdc

Terminal	Facility	Terminal function	Operation of equipment	Voltage
7	ARC-102 (HF SSB)	Switched ground from ARC-102 control panel P1808 pin U to ARC-102 receiver-transmitter P1806 pin 59 and to ARC-102 inverter P1809 pin 1	ARC-102 control panel function selector switch positioned to USB, LSB, or AM	+28 vdc if primary power supplied to ARC-102; ground when ARC-102 function selector switch positioned to USB, LSB, or AM
10	ARC-102 (HF SSB)	Switched ground from ARC-102 control panel P1808 pin q to ARC-102 receiver-transmitter P1806 pin 55 and to ARC-102 antenna coupler disconnect P1805 pin C	Interphone facilities turned and radio No. 4 (ARC-102) selected and keyed	+28 vdc until radio No. 1 (ARC-102) keyed; then ground

j. TB62, Crew interphone (Located in floor station 40)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
3	Interphone	Transmit control from right crew mic button or footswitch to terminal board TB70 section 3 terminal E	Interphone facility turned on and right crew mic button or footswitch depressed	+28 vdc until mic or footswitch depressed; then ground
6	Interphone	Transmit control from left crew mic button or footswitch to terminal board TB70 section 7 terminal E	Interphone facility turned on and left crew mic button or footswitch depressed	+28 vdc until mic or footswitch depressed; then ground

k. TB63, Interphone (Located in floor station 40)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
1	ARC-54 (No. 1 fm liaison)	Audio from audio threshold detector P3304 pin U to left crew ICS control panel P3805 pin KK	Radio No. 1 (ARC-54) turned on and tuned to a signal	Audio hi
2	ARC-51 (UHF)	Audio from terminal board TB20 terminal 3 to left and right crew terminal board TB70 section 5 terminal C	Radio No. 2 (ARC-51) turned on and tuned to a signal	Audio hi
3	ARC-115 (VHF-AM)	Audio from terminal board TB20 terminal 20 to left and right crew terminal board TB70 section 5 terminal J	Radio No. 3 (ARC-115) turned on and tuned to a signal	Audio hi
4	ARC-102 (HF SSB)	Audio from terminal board TB20 terminal 11 to left and right crew terminal board TB70 section 5 terminal H	Radio No. 4 (ARC-102) turned on and tuned to a signal	Audio hi
5	ARC-114 (No. 2 fm liaison)	Audio from terminal board TB20 terminal 12 to left and right crew terminal board TB70 section 6 terminal C	Radio No. 5 (ARC-114) turned on and tuned to a signal	Audio hi
6	ARN-82 (VOR)	Audio from terminal board TB19 terminal 2 to left and right crew terminal board TB70 section 6 terminal J	VOR (ARN-82) turned on and tuned to a signal	Audio hi
7	ARN-83 (LF-ADF)	Audio from terminal board TB19 terminal 3 to left and right crew terminal board TB70 section 6 terminal H	LF-ADF (ARN-83) turned on and tuned to a signal	Audio hi

Terminal	Facility	Terminal function	Operation of equipment	Voltage
8	APX-72 (IFF)	Audio from terminal board TB20 terminal 9 to left and right crew terminal board TB70 section 7 terminal C	IFF (APX-72) turned on and transponder ramp test set operating	Audio hi
9	R-1041A (Marker beacon receiver)	Audio from terminal board TB20 terminal 8 to left and right crew terminal board TB70 section 7 terminal H	Marker beacon receiver (R-1041A) turned on and a signal available	Audio hi
10	Interphone	Shield ground for wires connected to terminal board TB63 terminals 1 through 8 and 13	Not applicable	Ground
13	ARC-54 (No. 1 fm liaison)	Audio from audio threshold detector P3304 pin V to right crew ICS control panel P3806 pin KK	Radio No. 1 (ARC-54) turned on and tuned to a signal	Audio hi
14	ARC-114 (No. 2 fm liaison)	Transmit control ground from right crew ICS control panel P3806 pin BB to audio threshold detector P3304 pin K	Interphone facility turned on and radio No. 5 (ARC-114) selected and keyed from right crew station	+28 vdc until radio No. 5 keyed; then ground
15	ARC-102 (HF SSB)	Transmit control ground from right crew ICS control panel P3806 pin J to audio threshold detector P3304 pin L	Interphone facility turned on and radio No. 4 (ARC-102) selected and keyed from right crew station	+28 vdc until radio No. 4 keyed; then ground

Terminal	Facility	Terminal function	Operation of equipment	Voltage
16	ARC-115 (VHF-AM)	Transmit control ground from right crew ICS control panel P3806 pin N to audio threshold detector P3304 pin M	Interphone facility turned on and radio No. 3 (ARC-115) selected and keyed from right crew station	+28 vdc until radio No. 3 keyed; then ground
17	ARC-51 (UHF)	Transmit control ground from right crew ICS control panel P3806 pin T to audio threshold detector P3304 pin N	Interphone facility turned on and radio No. 2 (ARC-51) selected and keyed from right crew station	+28 vdc until radio No. 2 keyed; then ground

l. TB64, Interphone (Located in floor station 40)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
1	ARC-51 (UHF) and ARC-54 (No. 1 fm liaison) and ARC-102 (HF SSB) and ARC-114 (No. 2 fm liaison) and ARC-115 (VHF-AM) and interphone audio	Provides ground for wires connected to terminal board TB64 terminals 2 through 7	Not applicable	Ground
2	ARC-54 (No. 1 fm liaison)	Audio from left or right crew terminal board TB70 section 1 terminal C to terminal board TB20 terminal 4	Interphone facility turned on and radio No. 1 (ARC-54) selected and keyed	Audio hi
3	ARC-51 (UHF)	Audio from left or right crew terminal board TB70 section 1 terminal J to terminal board TB20 terminal 2	Interphone facility turned on and radio No. 2	Audio hi

Terminal	Facility	Terminal function	Operation of equipment	Voltage
			(ARC-51) selected and keyed	
4	ARC-115 (VHF-AM)	Audio from left or right crew terminal board TB70 section 1 terminal H to terminal board TB20 terminal 5	Interphone facility turned on and radio No. 3 (ARC-115) selected and keyed	Audio hi
5	ARC-102 (HF SSB)	Audio from left or right crew terminal board TB70 section 2 terminal C to terminal board TB20 terminal 6	Interphone facility turned on and radio No. 4 (ARC-102) selected and keyed	Audio hi
6	ARC-114 (No. 2 fm liaison)	Audio from left or right crew terminal board TB70 section 2 terminal J to terminal board TB20 terminal 7	Interphone facility turned on and radio No. 5 (ARC-114) selected and keyed	Audio hi
7	Interphone	Interphone audio to/from left or right crew terminal board TB70 section 2 terminal H to/from terminal board TB20 terminal 14	Interphone turned on and ICS selected	Audio hi
8	ARC-54 (No. 1 fm liaison)	Transmit control from left or right crew terminal board TB70 section 3 terminal C to terminal board TB19 terminal 4	Interphone facility turned on and radio No. 1 (ARC-54) selected and keyed	+28 vdc until radio No. 1 keyed; then ground
9	ARC-51 (UHF)	Transmit control from left crew ICS control panel P3805 pin T to audio threshold detector P3304 pin b	Interphone facility turned on and radio No. 2	+28 vdc until radio No. 2 keyed; then ground

Terminal	Facility	Terminal function	Operation of equipment	Voltage
			(ARC-51) selected and keyed from left crew station	
10	ARC-115 (VHF-AM)	Transmit control from left crew ICS control panel P3805 pin N to audio threshold detector P3304 pin c	Interphone facility turned on and radio No. 3 (ARC-115) selected and keyed from left crew station	+28 vdc until radio No. 3 keyed; then ground
11	ARC-102 (HF SSB)	Transmit control from left crew ICS control panel P3805 pin J to audio threshold detector P3304 pin d	Interphone facility turned on and radio No. 4 (ARC-102) selected and keyed from left crew station	+28 vdc until radio No. 4 keyed; then ground
12	ARC-114 (No. 2 fm liaison)	Transmit control from left crew ICS control panel P3805 pin BB to audio threshold detector P3304 pin e	Interphone facility turned on and radio No. 5 (ARC-114) selected and keyed from left crew station	+28 vdc until radio No. 5 keyed; then ground
13	KY-28 (Voice security)	Power from KY-28 control panel to audio threshold detector P3304 pin D and to terminal board TB70 section 4 terminal A to light left and right crew cipher lights	Voice security (KY-28) turned on and PLAIN/ CIPHER switch in CIPHER	+28 vdc

Terminal	Facility	Terminal function	Operation of equipment	Voltage
14	Interphone	Variable lamp voltage for left and right crew ICS control panels from terminal board TB12 terminal 2 to terminal board TB70 section 3 pin H	Rotation of pedestal light control dimmer	Minimum to +28 vdc

m. TB66, AF and dc grounds (Located on front of pedestal)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
1	Interphone	From local ground to copilot ICS control panel P3809 pin Z and to pilot ICS control panel P3810 pin Z and to A16 impedance matching network J600 pin f	Not applicable	Ground
2	Interphone	Ground to copilot ICS control panel P3809 pin N and to pilot ICS control panel P3810 pin N and to terminal board TB20 terminal 1 and to terminal board TB19 terminal 6	Not applicable	Ground
3	Interphone	Ground to wire shields at copilot and pilot ICS control panels P3809 and P3810 pins F, L, P, R, V, DD, EE, FF, KK, MM, PP, SS, TT, UU, WW, and XX	Not applicable	Ground
4	ARC-54 (No. 1 fm liaison)	Ground to ARC-54 control panel P2107 pin KK	Not applicable	Ground
5	KY-28 (Voice security)	Ground to KY-28 encoder-decoder P421 pin J	Not applicable	Ground
6	Interphone	Ground to copilot ICS control panel P3809 pins M and Y and to pilot ICS control panel P3810 pins M and Y	Not applicable	Ground
7	Interphone and ARC-115 (VHF-AM)	Local ground to ground bus on terminal board TB66 terminals 6, 7, 8, and 9 and to ARC-115 receiver-transmitter P3201 pin e	Not applicable	Ground

Terminal	Facility	Terminal function	Operation of equipment	Voltage
		and to audio threshold detector P3303 pin W and to wire shields at ARC-115 receiver-transmitter P3201 pins K, L, d and e		
8	Interphone	Not connected	Not applicable	Ground
9	Interphone and ARC-51 (UHF)	Ground to copilot ICS control panel P3809 pin K and to pilot ICS control panel P3810 pin K and to ARC-51 receiver-transmitter P1403 pins X and Y	Not applicable	Ground
10	ARN-82 (VOR)	Interconnect between ARN-82 receiver P304 pins B, P, and m and A32 capacitor board assembly terminal 3	VOR (ARN-82) turned on and tuned to a signal	ARN-82 vertical pointer deviation voltage

n. TB70, Crew interphone (Located in roof)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
		SECTION 1		
A,B,C,	ARC-54 (No. 1 fm liaison)	Audio from left crew ICS control panel P3805 pin V or from right crew ICS control panel P3806 pin V to terminal board TB64 terminal 2	Interphone facility turned on and radio No. 1 (ARC-54) selected and keyed	Audio hi
D,E,J,K	ARC-51 (UHF)	Audio from left crew ICS control panel P3805 pin R or from right crew ICS control panel P3806 pin R to terminal board TB64 terminal 3	Interphone facility turned on and radio No. 2 (ARC-51) selected and keyed	Audio hi
F,G,H	ARC-115 (VHF-AM)	Audio from left crew ICS control panel P3805 pin L or from right crew ICS control panel P3806 pin L	Interphone facility turned on and radio	Audio hi

Terminal	Facility	Terminal function	Operation of equipment	Voltage
		to terminal board TB64 terminal 4	No. 3 (ARC-115) selected and keyed	
		SECTION 2		
A,B,C	ARC-102 (HF SSB)	Audio from left crew ICS control panel P3805 pin F or from right crew ICS control panel P3806 pin F to terminal board TB64 terminal 5	Interphone facility turned on and radio No. 4 (ARC-102) selected and keyed	Audio hi
D,E,J,K	ARC-114 (No. 2 fm liaison)	Audio from left crew ICS control panel P3805 pin P or from right crew ICS control panel P3806 pin P to terminal board TB64 terminal 6	Interphone facility turned on and radio No. 5 (ARC-114) selected and keyed	Audio hi
F,G,H	Interphone	Interphone audio to/from left crew ICS control panel P3805 pin DD and and right crew ICS control panel P3806 pin DD to/from terminal board TB64 terminal 7	Interphone facility turned on and ICS selected	Audio hi
		SECTION 3		
A,B,C	ARC-54 (No. 1 fm liaison)	Transmit control from left crew ICS control panel P3805 pin X or from crew ICS control panel P3806 pin X to terminal board TB64 terminal 8	Interphone facility turned on and radio No. 1 (ARC-54) selected and keyed	+28 vdc until radio No. 1 keyed; then ground
D,E,J,K	Interphone	Transmit control from right crew headset connector J319A pin D or from right crew footswitch terminal board TB62 pin 3 to right crew ICS control panel P3806 pin B	Interphone facility turned on and right crew mic button or footswitch depressed	+28 vdc until right crew mic button or footswitch depressed; then ground

Terminal	Facility	Terminal function	Operation of equipment	Voltage
F,G,H	Interphone	Variable lamp voltage from terminal board TB64 terminal 14 to left crew ICS control panel P3805 pin U and to right crew ICS control panel P3806 pin U	Rotation of pedestal light control dimmer	Minimum to +28 vdc
		SECTION 4		
A,B,F,G	KY-28 (Voice security)	Power from terminal board TB64 terminal 13 to left crew cipher light DS82 terminal 2 and to right crew cipher light DS83 terminal 2	Voice security (KY-28) turned on and PLAIN/CIPHER switch in CIPHER	+28 vdc
C,D,E,H, J,K	Interphone	Ground interconnect to left crew ICS control panel P3805 pins H, M, and Y and to right crew ICS control panel P3806 pins H and Y	Not applicable	Ground
		SECTION 5		
A,B,C	ARC-51 (UHF)	Audio from terminal board TB63 terminal 2 to left crew ICS control panel P3805 pin SS and to right crew ICS control panel P3806 pin SS	Radio No. 2 (ARC-51) turned on and tuned to a signal	Audio hi
D,E,J,K	ARC-115 (VHF-AM)	Audio from terminal board TB63 terminal 3 to left crew ICS control panel P3805 pin PP and to right crew ICS control panel P3806 pin PP	Radio No. 3 (ARC-115) turned on and tuned to a signal	Audio hi
F,G,H	ARC-102 (HF SSB)	Audio from terminal board TB63 terminal 4 to left crew ICS control panel P3805 pin MM and to right crew ICS control panel P3806 pin MM	Radio No. 4 (ARC-102) tunred on and tuned to a signal	Audio hi
		SECTION 6		
A,B,C	ARC-114 (No. 2 fm liaison)	Audio from terminal board TB63 terminal 5 to left crew ICS control panel	Radio No. 5 (ARC-114) turned on	Audio hi

Terminal	Facility	Terminal function	Operation of equipment	Voltage
		P3805 pin EE and to right crew ICS control panel P3806 pin EE	and tuned to a signal	
D,E,J,K	ARN-82 (VOR)	Audio from terminal board TB63 terminal 6 to left crew ICS control panel P3805 pin UU and to right crew ICS control panel P3806 pin UU	VOR (ARN-82) turned on and tuned to a signal	Audio hi
F,G,H	ARN-83 (LF-ADF)	Audio from terminal board TB63 terminal 7 to left crew ICS control panel P3805 pin WW and to right crew ICS control panel P3805 pin WW	LF-ADF (ARN-83) tunred on and tuned to signal	Audio hi
		SECTION 7		
A,B,C	APX-72 (IFF)	Audio from terminal board TB63 terminal 8 to left crew ICS control panel P3805 pin FF and to right crew ICS control panel P3806 pin FF	IFF (APX-72) turned on and transponder ramp test set operating	Audio hi
D,E,J,K	Interphone	Transmit control from left crew headset connector J319B or from left crew footswitch terminal board TB62 pin 3 to left crew ICS control panel P3805 pin B	Interphone facility turned on and left crew mic button or footswitch depressed	+28 vdc until left crew mic or footswitch depressed; then ground
F,G,H	R1041A (Marker beacon receiver)	Audio from terminal board TB63 pin 9 to left crew ICS control panel P3805 pin HH and to right crew ICS control panel P3806 pin HH	Marker beacon receiver (R1041A) turned on and a signal available	Audio hi
		SECTION 8		
A	Interphone	Ground to wire shields at left crew ICS control panel P3805 pins F, L, P, R, V, DD, TT, and XX	Not applicable	Ground

Terminal	Facility	Terminal function	Operation of equipment	Voltage
B	Interphone	Ground to wire shields at left crew ICS control panel P3805 pins EE, FF, KK, MM, PP, SS, UU, and WW	Not applicable	Ground
C	Interphone	Ground to left crew ICS control panel P3805 pin Z	Not applicable	Ground
D	Interphone	Ground to left crew ICS control panel P3805 pin K	Not applicable	Ground
E	Interphone	Ground to right crew ICS control panel P3806 pin K	Not applicable	Ground
F	Ground	Spare ground	Not applicable	Ground
G	Interphone	Local ground connection	Not applicable	Ground
H	Interphone	Ground to wire shields at right crew ICS control panel P3806 pins F, L, P, R, V, DD, TT, and XX	Not applicable	Ground
J	Interphone	Ground to wire shields at right crew ICS control panel P3806 pins EE, FF, KK, MM, PP, SS, UU, and WW	Not applicable	Ground
K	Interphone	Ground to right crew ICS control panel P3806 pin Z	Not applicable	Ground

o. TB71, ARC-54 (Located in right side of nose compartment)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
1	ARC-54 (No. 1 fm liaison)	Power from deviation indicator flag K54 terminal X1 to anode of diode CR33	Radio No. 1 (ARC-54) turned on and mode selector switch positioned to HOME	+28 vdc

Terminal	Facility	Terminal function	Operation of equipment	Voltage
2	ARC-54 (No. 1 fm liaison)	Power from cathode of diode CR 33 to ARC-54 receiver-transmitter P2106 pin 16	Radio No. 1 turned on and mode selector switch positioned to HOME	+28 vdc

3-17.1. Terminal Board Voltage Measurements (R-1963/ARN Glideslope Marker Beacon Facility)

a. TB20, Interphone (Located in communications junction box on back of pedestal)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
8	R-1963 (Glideslope/Marker Beacon receiver)	Marker beacon audio from R-1963 receiver J506 pin R to copilot ICS control panel P3809 pin HH and to pilot ICS control panel P3810 pin HH and to left and right crew terminal board TB63 terminal 9.	Glideslope/Marker Beacon facility turned on and a signal available	Audio hi

b. TB26, Audio and dc grounds (Located in pedestal)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
3	R-1963 (Glideslope Marker Beacon receiver)	Ground to R-1963 receiver P1 pin 8.	Not applicable	Ground

3-17.2. Terminal Board Voltage Measurements (AN/ARN-123(V) VOR/ILS Facility)

a. TB1, VOR and ADF (Located forward of pedestal)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
6	ARN-123 (VOR/ILS), ID-998 (Pilot course indicator), and ID-250A (Copilot course indicator).	Stator Y error voltage from ARN-123 receiver P11001 pin 13 to ID-998 indicator P403 pin 30, and to ID-250A indicator P409 pin U.	Control, C-10048/ ARN-123(V) turned on.	400 Hz error signal; 26 volt maximum.
7	ARN-123(VOR/ILS), ID-998 (Pilot course indicator), and ID-250A (Copilot course indicator)	Stator X error voltage from ARN-123 receiver P11001 pin 12 toID-998 indicator P403 pin 29 and to ID-250A indicator P403 pin T.	Control C-10048/ARN-123(V) turned on	400 Hz error signal; 26 volt maximum.
12	ARN-123(VOR/ILS), ID-998 (Pilot course indicator), and ID-250A (Copilot course indicator)	Primary power from COURSE IND circuit breaker (CB8) on ac circuit breaker panel to ARN-123 receiver P12002 pin 18 and to ID-998 indicator P403 pins 16, 21, 27, 34 and 53, and to ID-250A indicator P409 pins G, S and V.	COURSE IND circuit breaker (CB8) on ac circuit breaker panel depressed.	26 vac, 400 Hz

b. TB12, Panel Lights (Located in pedestal)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
1	AN/ARN-123(VOR/ILS)	Panel light power from pedestal light control dimmer to ARN-123 control panel P1 pin 21.	Rotation of pedestal light control dimmer.	Minimum to +28 vdc.

c. TB19, Interphone (Located in communications junction box on back of pedestal)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
6	ARN-123 (VOR/ILS)	Audio lo (VOR and localizer) from ARN-123 control panel P1 pin 1 to TB66 pin 2	ARN-123 turned on and tuned to a signal.	Ground
7	ARN-123 (VOR/ILS)	Audio hi (VOR and localizer) from ARN-123 control panel P1 pin 2 to pin UU of pilot ICS control P3810, pin UU of copilot ICS control P3809, and to left and right crew TB63 pin 6.	ARN-123 turned on and tuned to a signal.	Audio hi

d. TB20, Interphone (Located in communications junction box on back of pedestal)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
8	ARN-123 (VOR/ILS)	Marker beacon audio from P1 pin 18 of ARN-123 control panel to pilot ICS control panel P3810 pin HH, to copilot ICS control panel P3809 pin HH, and to left and right crew TB 63 terminal 9	ARN-123 turned on and marker beacon signal available.	Audio hi

e. TB26, Audio and dc Grounds (Located in pedestal)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
3	ARN-123 (VOR/ILS)	Ground to ARN-123 receiver P12002 pins 2 and 28 and to ARN-123 control panel P1 pin 10	Not applicable.	Ground

f. TB66, AF and dc Grounds (Located in front of pedestal)

Terminal	Facility	Terminal function	Operation of equipment	Voltage
10	ARN-123 (VOR/ILS)	Interconnect between ARN-123 receiver P12002 pins 1, 20 and 25 and marker beacon lamp terminal 2	ARN-123 turned on and marker beacon signal available.	+28 dc

Terminal	Facility	Terminal function	Operation of equipment	Voltage
2	ARC-54 (No. 1 fm liaison)	Power from cathode of diode CR33 to ARC-54 receiver-transmitter P2106 pin 16	Radio No. 1 turned on and mode selector switch positioned to HOME	+28 vdc

3-17.3. Terminal Board Voltage Measurements AN/APN-209 Radar Altimeter Facility

a. TB 13 (located at rear of copilot instrument panel).

Terminal	Facility	Terminal function	Operation of equipment	Voltage
4	Radar Altimeter RI	RI light power from pilot instrument panel light control dimmer to digital display and warning lamps on RI P1 pin 6.	Radar altimeter RI turned on. Pilot instrument lighting on.	0 to + 28 volt dc
9	Radar Altimeter IRT	IRT light power from copilot instrument panel light control dimmer to digital display and warning lamps on IRT P1 pin 7.	Radar altimeter IRT turn on. Copilot instrument lighting on.	0 to + 28 volt dc.

b. TB100 (located in nose radio compartment).

Terminal	Facility	Terminal function	Operation of equipment	Voltage
3	Radar Altimeter RI	RI light power from pilot 5 volt power supply to integral lights on RI P1 pin 17.	Radar altimeter RI turned on PILOT 5 VOLT LIGHTS circuit breaker depressed.	0 to + 5 volt dc
8	Radar Altimeter IRT	IRT light power from copilot 5 volt power supply to integral lights on IRT P1 pin 10.	Radar altimeter IRT turned on. COPILOT 5 VOLT LIGHTS circuit breaker depressed.	0 to + 5 volt dc

3-18. Resistance Measurements and Troubleshooting

a. Marker Beacon Controls, Compass Slaving Switch, IFF Mode 4 Light, and IFF Code Hold Switch. These lights and controls are located on the instrument panel. Troubleshooting is accomplished using a multimeter connected to the connecter pins of P506 and by simultaneously positioning some of the switches or lights. Disconnect J506 from P506, located forward of the instrument panel to right of center line and accessible through the radio compartment in the nose section. Ensure that power is off to prevent damage to multimeter, then set multimeter to ohms and connect to connector pins of P506 listed in chart.

Terminal	Component	Multimeter reading
M & N	Switch part of R18 (Marker beacon on-off-volume turned off)	Infinite
M & N	Switch part of R18 (Marker beacon on-off-volume turned on)	0 ohm
P & structure	R18	150 ohms
R & structure	R18 (Marker beacon on-off-volume turned to maximum volume)	150 ohms
R & structure	R18 (Marker beacon on-off-volume turned off)	0 ohm
S & structure	S57 (Sense switch positioned to HI, toggle up)	0 ohm
S & structure	S57 (Sense switch positioned to LO, toggle down	Infinite
T & structure	DS35 (Marker beacon indicator light)	Lamp resistance
T & structure	DS35 (Marker beacon indicator light depressed, PUSH TO TEST)	Infinite
M & structure	DS35 (Marker beacon indicator light)	Infinite
M & structure	DS35 (Marker beacon indicator light depressed, PUSH TO TEST)	Lamp resistance
U & V	S49 (Compass slaving switch positioned to DG, toggle up)	Infinite
U & V	S49 (Compass slaving switch positioned to MAG, toggle down)	0 ohm
A & structure	S62 (IFF code hold switch positioned to OFF, toggle up)	Infinite
A & structure	S62 (IFF code hold switch positioned to CODE HOLD, toggle down)	0 ohms
B & structure	S62 (IFF code hold switch positioned to CODE HOLD, toggle down) and DS84 (IFF mode 4 light)	Lamp resistance
B & structure	S62 (IFF code hold switch positioned to OFF, toggle up)	Infinite
B & structure	S62 (IFF code hold switch positioned to OFF, toggle up) and DS84 (IFF mode 4 light depressed, PUSH TO TEST)	Lamp resistance

Terminal	Component	Multimeter reading
	NOTE	
These measurements effective when R-1963/ARN Glideslope/Marker Beacon facility is installed.		
T & M	Switch part of R18 (Marker beacon on-off volume turned off)	Infinite
T & M	Switch part of R18 (Marker beacon on-off volume turned on)	Lamp resistance
	NOTE	
When AN/ARN-123(V) VOR/ILS facility is installed, following entries replace all chart entries pertaining to marker beacon controls.		
S & structure	DS35 (marker beacon indicator light)	Infinite
S & T	DS35 (marker beacon indicator light)	Lamp resistance
S & T	DS 35 (marker beacon indicator light depressed, PUSH TO TEST)	Infinite
T & structure	DS35 (marker beacon indicator light)	Infinite
T & structure	DS35 (marker beacon indicator light depressed, PUSH TO TEST)	Lamp resistance

CHAPTER 4

DIRECT AND GENERAL SUPPORT TESTING PROCEDURES

Section I. INTRODUCTION

4–1. General

a. These testing procedures are prepared for use by maintenance shops and supporting service organizations responsible for performing direct and general support maintenance on avionics electronic equipment to determine the acceptability of repaired equipment. These procedures set forth specific requirements that repaired electronic equipment must meet before it is returned to the using organization.

b. Comply with the instructions preceding the body of each chart before performing the procedures in the chart. When fully repaired units on components are being tested, perform each test for the particular unit or component in the sequence given. Do not vary the sequence. For each step, perform all actions in the control settings column, then perform each specific test procedure, and verify the results obtained against the data given in the performance standard column.

c. When an equipment has had minor repairs performed on it by general support maintenance teams operating within a depot, or operating under depot supervision, and is to be returned to the user instead of to Army supply stocks, deviations from the testing procedures may occur if:

(1) The deviation does not result in a lower performance standard.

(2) The specific deviations are approved by the quality assurance officer of the applicable depot.

d. The performance standards listed in the tests assume that all pertinent modification work orders have been performed. Check the current issue of DA Pam 310-7 to find the latest listing of modification work orders of the equipment under test. Tests required for the equipment included in this publication are a part of the appropriate manuals referenced in appendix A. The tests which are required and not covered by the referenced manuals are to be found in paragraphs 4-3 and 4-4.

4–2. Test Equipment, Tools, Materials, and Other Equipment Required

All test equipment, tools, materials, and other equipment required to perform the testing procedures in this chapter are listed in the following charts. These items are authorized under TA 11-17, Field Maintenance Shops (Electronics), and TA 11-100, Allowances of Electronic Command Expendable Supplies for Field Maintenance Shops, Continental United States, or are repair parts authorized for stockage by direct support maintenance organizations.

Section II. TESTING IMPEDANCE MATCHING NETWORK (A16)

4–3. Impedance Matching Network

Equipment, materials, test connections, conditions, and procedures for physically testing and inspection of impedance matching network, Part No. 212-075-329-7 are as follows.

a. Test Equipment and Materials. The handtools contained in Tool Kit, Electronic Equipment TK-100/U and Multimeter ME-26/U are required.

b. Test Conditions. Remove the network from the communications junction box.

c. Test Procedures, Mechanical. Perform the following visual inspection.

Step No.	Test procedure	Performance standard
1.	Inspect for broken or loose components and for damage.	All solder connections are tight and no damage is evident.
2.	Inspect board for cracks or damage.	No cracked or damaged varnish.
3.	Inspect printed circuit.	No damage.

d. Test Procedures, Electrical. Perform the following connector pin to pin test using ME-26/U multimeter. Set the meter so that readings are near midscale for greater accuracy. If a particular circuit or component associated with a facility is suspect of being faulty, test that circuit first to reduce total test time; otherwise, proceed in order listed.

Step No.	Pin to pin		Performance standard	Resistor	Facility
1	f	28	0 ohms	None	All
2	e	27	0 ohms	None	ARC-115
3	e	f	142 to 158 ohms	R603	ARC-115
4	d	f	142 to 158 ohms	R604	ARC-114
5	d	26	0 ohms	None	ARC-114
6	25	f	142 to 158 ohms	R605	Interphone
7	b	f	142 to 158 ohms	R606	ARC-51
8	b	24	0 ohms	None	ARC-51
9	22	f	142 to 158 ohms	R608	APX-72
10	20	f	142 to 158 ohms	R610	KY-28
11	W	19	142 to 158 ohms	R602	ARC-102
12	W	f	142 to 158 ohms	R611	ARC-102
13	V	f	370 to 410 ohms	R612	ARN-83
14	V	18	171 to 189 ohms	R613	ARN-83
15	U	T	0 ohms	None	ARC-102
16	U	f	1.14K to 1.26K ohms	R614	ARC-102
17	S	f	142 to 158 ohms	R617	ARN-123(V)

Section III. TESTING AUDIO THRESHOLD DETECTOR (Z20)

4–4. Audio Threshold Detector

Equipment, materials, test connections, conditions, and procedures for physically testing and inspection of audio threshold detector Part No. 205-075-399-1 are as follows.

a. Test Equipment and Materials. The handtools contained in Tool Kit, Electronic Equipment TK-100/U and Multimeter ME-26/U are required.

b. Test Conditions. Remove the audio threshold detector from the communications junction box.

c. Test Procedures, Mechanical. Perform the following visual inspection.

Step No.	Test procedure	Performance standard
1.	Inspect for mechanical condition and absence of dirt and foreign material.	No physical damage, dirt, or foreign material.
2.	Inspect electrical connector for burnt, broken, or bent pins and foreign material.	All connector pins clean and straight and no dirt or foreign material.

d. Test Procedures, Electrical. Because of the length of the tests, the electrical testing is accomplished in two steps; the first step checks the audio components of the audio threshold detector while the second step checks the dc components. If a particular circuit or component associated with a facility is suspect of being faulty, test that circuit first to reduce total test time; otherwise, proceed in order listed.

(1) Perform testing of the audio components using ME-26/U multimeter connected to the pins of connector P3303. On the meter, select the appropriate scale range that will provide near midscale indications. The 600 ohms performance standard value listed in the chart is an approximate value of internal audio transformers.

Step No.	Pin to pin		Performance standard	Facility
1	B	F	0 ohms	ARC-51
2	B	A	infinity	ARC-51
3	U	A	600 ohms	ARC-51
4	U	Y	0 ohms	ARC-51
5	U	E	600 ohms	ARC-51
6	H	D	0 ohms	ARC-115
7	H	G	infinity	ARC-115
8	Z	G	600 ohms	ARC-115
9	Z	W	0 ohms	ARC-115

Step No.	Pin to pin		Performance standard	Facility
10	Z	C	600 ohms	ARC-115
11	K	P	0 ohms	ARC-102
12	K	J	infinity	ARC-102
13	a	J	600 ohms	ARC-102
14	a	c	0 ohms	ARC-102
15	a	N	600 ohms	ARC-102
16	S	M	0 ohms	ARC-114
17	S	R	infinity	ARC-114
18	e	R	600 ohms	ARC-114
19	e	b	0 ohms	ARC-114
20	e	L	600 ohms	ARC-114

(2) Perform testing of the dc components using the ME-26/U multimeter connected to the pins of connector P3304. To determine meter polarity for testing of internal diodes, connect meter probes between pins h and w and note meter reading; then reverse meter probes and again note meter reading. The ratio between the two readings should be 100 to 1 or higher indicating diode action. Connect the meter again so that the lower reading is obtained; for the remainder of this test connect probe now connected to pin h to the pin listed on tne left in the following chart.

Step No.	Pin to pin		Performance standard	Facility
1	h	W	Forward diode	ARC-114
2	h	a	Forward diode	ARC-114
3	h	K	Forward diode	ARC-114
4	h	e	Forward diode	ARC-114
5	W	h	Reverse diode	ARC-114
6	a	h	Reverse diode	ARC-114
7	K	h	Reverse diode	ARC-114
8	e	h	Reverse diode	ARC-114
9	E	S	Forward diode	ARC-102
10	E	Z	Forward diode	ARC-102

Step No.	Pin to pin		Performance standard	Facility
11	E	L	Forward diode	ARC-102
12	E	d	Forward diode	ARC-102
13	S	E	Reverse diode	ARC-102
14	Z	E	Reverse diode	ARC-102
15	L	E	Reverse diode	ARC-102
16	d	E	Reverse diode	ARC-102
17	G	R	Forward diode	ARC-115
18	G	Y	Forward diode	ARC-115
19	G	M	Forward diode	ARC-115
20	G	c	Forward diode	ARC-115
21	R	G	Reverse diode	ARC-115
22	Y	G	Reverse diode	ARC-115
23	M	G	Reverse diode	ARC-115
24	c	G	Reverse diode	ARC-115
25	F	J	Forward diode	ARC-51
26	F	X	Forward diode	ARC-51
27	F	N	Forward diode	ARC-51
28	F	b	Forward diode	ARC-51
29	J	F	Reverse diode	ARC-51
30	X	F	Reverse diode	ARC-51
31	N	F	Reverse diode	ARC-51
32	b	F	Reverse diode	ARC-51
33	D	W	Forward diode + 80 ohms	ARC-114
34	D	a	Forward diode + 80 ohms	ARC-114
35	D	K	Forward diode + 80 ohms	ARC-114
36	D	e	Forward diode + 80 ohms	ARC-114

Step No.	Pin to pin		Performance standard	Facility
37	D	S	Forward diode + 80 ohms	ARC-102
38	D	Z	Forward diode + 80 ohms	ARC-102
39	D	L	Forward diode + 80 ohms	ARC-102
40	D	d	Forward diode + 80 ohms	ARC-102
41	D	R	Forward diode + 80 ohms	ARC-115
42	D	Y	Forward diode + 80 ohms	ARC-115
43	D	M	Forward diode + 80 ohms	ARC-115
44	D	c	Forward diode + 80 ohms	ARC-115
45	D	J	Forward diode + 80 ohms	ARC-51
46	D	X	Forward diode + 80 ohms	ARC-51
47	D	N	Forward diode + 80 ohms	ARC-51
48	D	b	Forward diode + 80 ohms	ARC-51
49	W	D	Reverse diode	ARC-114
50	a	D	Reverse diode	ARC-114
51	K	D	Reverse diode	ARC-114
52	e	D	Reverse diode	ARC-114
53	S	D	Reverse diode	ARC-102
54	Z	D	Reverse diode	ARC-102
55	L	D	Reverse diode	ARC-102
56	d	D	Reverse diode	ARC-102
57	R	D	Reverse diode	ARC-115
58	Y	D	Reverse diode	ARC-115
59	M	D	Reverse diode	ARC-115
60	c	D	Reverse diode	ARC-115
61	J	D	Reverse diode	ARC-51
62	X	D	Reverse diode	ARC-51

Step No.	Pin to pin		Performance standard	Facility
63	N	D	Reverse diode	ARC-51
64	b	D	Reverse diode	ARC-51
65	A	U	0 ohms	Left crew
66	A	V	0 ohms	Right crew
67	A	T	0 ohms	Copilot
68	A	f	0 ohms	Pilot
69	P	U	Infinity	Left crew
70	P	V	Infinity	Right crew
71	P	T	Infinity	Copilot
72	P	f	Infinity	Pilot

CHAPTER 4.1

PROXIMITY WARNING FACILITY

Section I. INTRODUCTION

4.1-1. Scope

a. This chapter covers direct and general support maintenance of the Proximity Warning Facility, YG-1054 for use with Army Helicopter Model UH-1H, Serial Numbers 71-20000 and subsequent. This chapter includes instructions appropriate to direct support maintenance personnel for performance of periodic inspections and for troubleshooting the proximity warning facility when installed in the helicopter.

b. Bench maintenance of the Proximity warning facility is covered in a separate technical manual.

c. Block diagram analysis is contained in TM 11-1520-210-20-1. Analyses of the electronic configuration interunit circuits is covered in paragraph 4.1-3 of this chapter.

4.1-2. Electronic Configuration.

The proximity warning facility can be used with configuration I, Model UH-1H, serial 71-20000 and subsequent after MW055-1520-210-30/40 has been applied.

Section II. CONFIGURATION INTERUNIT CIRCUIT ANALYSIS

4.1-3. Proximity Warning Facility, YG-1054 (fig. 4.1)

a. *Power Distribution.* Primary power (+28-volt dc) for the proximity warning facility YG-1054 receiver-transponder is supplied through circuit breaker PROX WARN. With PROX WARN circuit breaker depressed, +28-volt dc is applied to pin A of J1 at Receiver-Transponder YG-1054. Panel lighting for the receiver-transponder (+28-volt dc) is routed from terminal board TB12 to pin C of J1 at the receiver-transponder.

b. *Audio Distribution.* Audio signals from the proximity warning facility are routed to the intercommunication system as follows: On aircraft that have had MW055-1520-210-30/34 and MW055-1520-210-30/40 applied, audio signals from the proximity warning facility are coupled through pin F of J1 and P1 to terminal 9 of terminal board TB20. Terminal 9 of terminal board TB20 is an audio distribution point in which signals are routed to pin 27 of all C-1611/AIC interphone panels. The audio warning signal is also routed from terminal 9 of terminal board TB20 to terminal 3 of terminal board TB20/1 through a 8,200 ohm resistor to terminal 2 of terminal board TB20/1 through a second resistor (150 ohm) to terminal 1 of terminal board TB20/1 to ground. The 8,200 ohm resistor serves as an isolation resistor between the AN/APX-72 audio and the proximity warning facility audio. The AN/APX-72 audio from pin 9 of P916 is routed to terminal 2 of terminal board TB20/1. Audio signals from the proximity warning facility are coupled through pin F of J1 and P1 to terminal 9 of terminal board TB20. On aircraft, serial numbers 71-20000 and subsequent, the proximity audio warning signal is routed from terminal 9 of terminal board TB20 to terminal 9 of terminal board TB19 through resistor R1 (8.2K ohms) to terminal 8 of terminal board TB19, to pin 22 of J600 on the impedance pad through a 150 ohm resistor to ground. Resistor R1 serves as an isolation resistor between the AN/APX-72 audio and the proximity warning facility audio. The AN/APX-72 audio from pin 9 of P916 is routed to terminal 8 of terminal board TB19.

Section III. PROXIMITY WARNING FACILITY BLOCK DIAGRAM ANALYSIS

4.1-4. General

Block diagram analysis of the proximity warning facility is covered in TM 11-1520-210-20-1.

Section IV. DIRECT SUPPORT MAINTENANCE

4.1-5. General Instructions

The direct support maintenance procedures in this chapter also supplement the organizational maintenance procedures in TM 11-1520-210-20-1. These procedures also supplement the operating and service instructions to provide complete repair and maintenance instructions. The proximity warning facility maintenance procedures begin with the functional operation and sectionalization checks which can be performed by organizational and direct support maintenance personnel within the helicopter and are extended to removal and replacement of units or components from the helicopter. When the components are removed from the helicopter the systematic maintenance procedures continue with the bench maintenance of the individual electronic equipment components. Paragraph 4.1-8 of this chapter provides direct support troubleshooting and repair of the proximity warning facility installation within the helicopter and supplement the organizational maintenance procedures.

4.1-6. Troubleshooting Procedures

a. *General.* Troubleshooting the proximity warning facility in Army Model UH-1H helicopters is to trace the trouble to the defective unit that is part of the system and/or associated junction box, terminal boards, cabling or wiring. Bench maintenance on a removed electronic equipment component will be performed only at designated training commands.

b. *Operational tests.* Operational tests as outlined in TM 11-1520-210-20-1 will help in determining the exact nature of the fault.

c. *Performance tests.* The periodic preventive maintenance checks and services chart tests (TM 11-1520-210-20-1) are used in conjunction with the troubleshooting charts to locate faulty items.

4.1-7. Test Equipment and Tools Required

The test equipment and tools required for troubleshooting the proximity warning facility as installed in UH-1H Series helicopters are as follows:

a. Multimeter AN/URM-105
b. Tool kit, Radio Repair TK-100/G.
c. Tool kit, Radar and Radio Repair TK-101/G.

4.1-8. Troubleshooting Proximity Warning Facility (YG-1054 Configuration I.)

a. *Facility Performance Test*

(1) Connect an auxiliary power unit to the external power receptacle on the aircraft.

(2) Set the BATTERY switch ON.

(3) Depress the PROX WARN circuit breaker on the dc circuit breaker panel.

(4) On the proximity warning facility, set the POWER switch ON. Wait at least one minute for the equipment to warm up and stabilize before proceeding. The BELOW, EQUAL and ABOVE indicator lamps will momentarily flash and the proximity warning facility audio will also sound for approximately one second.

NOTE

Two types of ground power tests are possible: a transponder ground test and a confidence test. The transponder ground test is a ground system check-out that uses a remote ground transponder tester UG2330AA01 which simulates a second aircraft. The confidence test is a go/no-go type check (self-test) that is normally performed in flight, but which can also be performed on the ground. Both types of tests are covered in TM 11-1520-210-20-1.

(5) For the confidence test, set the TRANSPONDER GND TEST/CONFIDENCE TEST switch to CONFIDENCE TEST. The receiver-transponder ABOVE, EQUAL and BELOW indicator lamps should alternately flash on and off and a pulsing audio alarm should be heard in the headsets.

(6) For the transponder ground test, refer to TM 11-1520-210-20-1.

(7) Remove power from the proximity warning receiver-transponder by setting the POWER switch OFF.

4.1-9. Terminal Board Voltage Measurements.

Charts for all terminal boards (TB) associated with the proximity warning facility are given in a through *d* below. The charts list the functional and voltage values (where applicable) of each terminal on the terminal boards associated with the proximity warning facility. All dc voltages are listed and audio voltages are indicated, but values are not listed because the value depends upon individual volume control settings. The location of these terminal boards is shown in TM 55-1520-210-20-1. If a trouble develops in the proximity warning facility and the facility performance checks do not indicate the source of trouble, refer to the following charts and check the voltages at the applicable terminals. If the measured voltage does not agree with the specified voltage for the particular terminal, refer to the master wiring diagram in TM 55-1520-210-20-1 and trace the wiring back to the power source, basic signal equipment or installation item to locate the fault.

b. *Proximity Warning Facility, YG-1054 Facility Troubleshooting Chart (Configuration I).*

Symptom	Probable cause	Corrective measures
1. Control panel lamps do not light when helicopter primary power switch is set to ON.	Panel lamps loose in sockets or burned out.	Check panel lamps for proper seating and replace if necessary.
2. PROX WARN circuit breaker opens when receiver-transponder is turned on.	Primary power is shorted in wiring from circuit breaker or receiver-transponder.	Disconnect receiver-transponder, depress breaker. If breaker does not trip, replace receiver-transponder. If breaker trips, check out primary wiring.
3. Receiver-transponder ABOVE, EQUAL and BELOW lamps do not light when CONFIDENCE TEST switch is ON	a. Panel lamps defective. b. Receiver-transponder defective.	a. Replace panel lamps. b. Replace receiver-transponder.
4. Receiver-transponder ABOVE, EQUAL and BELOW lamp cycle when CONFIDENCE TEST switch is ON but audio alarm is not heard in headset.	a. Audio line from receiver-transponder open or shorted. b. Receiver-transponder defective.	a. Check audio lines from receiver-transponder. b. Replace receiver-transponder.
5. Continuous alarm or no alarm.	Defective receiver-transponder (digital/display module).	Replace receiver-transponder.

a. *TB12, Proximity warning facility (Located in pedestal).*

Terminal	Facility	Terminal function	Operation of equipment	Voltage
1	Proximity warning facility	DC primary power to panel lamps.	Aircraft instrument lighting on.	0 to +28vdc depending upon position of lighting rheostat.

b. *TB19, Interphone (Located in communications junction box on back of pedestal).*

Terminal	Facility	Terminal function	Operation of equipment	Voltage
8	Proximity warning facility.	IFF-APX ( ) audio, 8,200 ohm resistor and proximity warning facility audio termination point to pin 22 on impedance matching network.	Proximity receiver-transponder turned on, confidence test switch on.	Audio hi
9	Proximity warning facility.	Isolation resistor 8,200 ohm and proximity warning facility audio termination point.	Proximity receiver-transponder turned on, confidence test switch on.	Audio hi

c. *TB20, Interphone (Located in communications junction box on back of pedestal).*

Terminal	Facility	Terminal Function	Operation of equipment	Voltage
9	Proximity warning facility.	Proximity warning facility audio from pin F of receiver-transponder to C1611/AIC pin 27, stations; copilot, and crewmembers.	Proximity receiver-transponder turned on, confidence test switch on.	Audio hi

d. TB20/1, Pedestal Compartment (After MW055-1520-210-30/34 and MW055-1520-210-30/40 have been applied).

Terminal	Facility	Terminal function	Operation of equipment	Voltage
1	Proximity warning facility.	IFF-APX ( ) audio, load resistor and proximity warning facility audio ground termination.	Proximity warning facility turned on, confidence test switch on.	Zero
2	Proximity warning facility.	IFF-APX ( ) audio, 8,200 ohm 150 ohm and proximity warning facility audio terminations.	Proximity warning facility turned on, confidence test switch on.	Audio
3	Proximity warning facility.	Proximity warning facility audio and 8,200 ohm isolation resistor termination.	Proximity warning facility turned on, confidence test switch on.	Audio

e. TB26, Audio and dc grounds (Located in pedestal).

Terminal	Facility	Terminal function	Operation of equipment	Voltage
1	Proximity warning facility.	Proximity warning facility audio ground.		Zero
4	Proximity warning facility.	Proximity warning ground.		Zero
5	Proximity warning facility.	Proximity warning lamp ground.		Zero

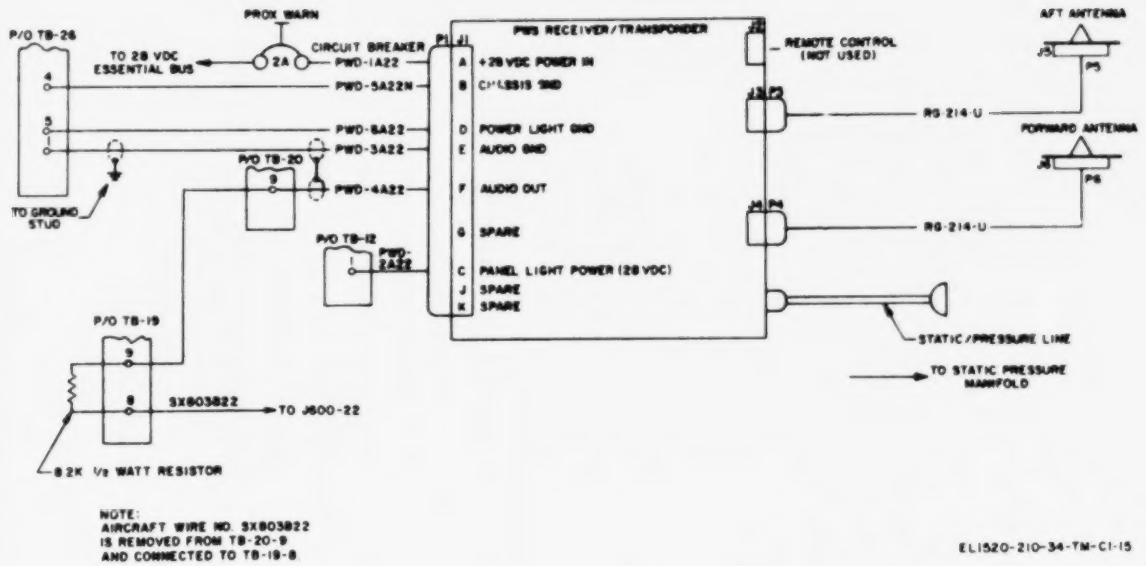


Figure 4.1 Proximity warning facility YG-1054, wiring diagram.

CHAPTER 4.2

AUDIO THRESHOLD SYSTEM (ATS)

Section I. INTRODUCTION

4.2-1. General

This chapter contains information required for direct and general support maintenance of the audio threshold system (ATS) and includes appropriate bench or shop testing instructions, troubleshooting and maintenance procedures.

4.2-2. Description

a. The audio threshold system (ATS) consists of a solid state audio threshold detector (Z20) that operates in conjunction with each non-secure communications radio and the secure No. 1 and No. 2 fm radios during secure voice operation.

b. The audio threshold detector, comprised of a chassis, circuit board assembly and cover, contains an audio section and a control section. The audio section consists of special transformer coupling networks that couple radio transmit audio signals to the appropriate radio facilities and block low amplitude audio signals which generally occur from crosstalk. The control section consists of a relay network which ensures adequate crosstalk isolation by muting the secure voice audio sidetone from the ICS station keying a non-secure radio facility.

c. Functionally, the audio and control sections operate as follows:

(1) The audio section monitors four separate audio lines and provides an output signal for each when the input signal to the line exceeds the threshold level.

(2) The control section contains four relays, each of which can be energized from four different source lines. The relays each provide two output states on a single output line corresponding to either the energized or de-energized condition. In addition, four outputs are provided that can be used to indicate which of the four source lines is energized at any given time.

Section II. TESTING AND TROUBLESHOOTING AUDIO THRESHOLD SYSTEM

4.2-3. General

The testing and troubleshooting procedures in this section are prepared for use by maintenance shops and supporting organizations responsible for performing direct and general support maintenance of the audio threshold system.

4.2-4. Test Equipment

The following listed test equipment is required to perform the testing procedures presented in this section:

Commercial test equipment	Equivalent Army test equipment
Multimeter, Simpson Model 260	Multimeter AN/USM-223
Oscilloscope, Hewlett-Packard Model 180AR	Oscilloscope AN/USM-120
Multimeter, Hewlett-Packard Model 400H	Voltmeter, Electronic ME-30E/U
Audio Oscillator, Hewlett Packard Model 201C	Oscillator, Audio Frequency NSN 6625-00-678-5616
28 Vdc Power Supply	Power Supply + 27.5 ± 0.5 Vdc

NOTE

Because of the time element involved and different test setups required, the following bench test procedures are presented in two separate phases — the audio section and the control section.

4.2-5. Test Procedures, ATS Audio Section

Set up the audio section test equipment as shown in figure 4.2-1.

a. The following input and output terminals must be utilized for the audio section tests:

Channel No.	Pin No.	Input terminal (J1) function	Pin No.	Output terminal (J1) function
1	A	Input high	E	Output high
	U	Input low	Y	Output low
2	G	Input high	C	Output high
	Z	Input low	W	Output low
3	J	Input high	N	Output high
	a	Input low	c	Output low
4	R	Input high	L	Output high
	e	Input low	b	Output low

b. Connect a 150 ohm resistor across the audio frequency oscillator output terminals. Connect the electronic voltmeter across the audio frequency oscillator. Connect the audio frequency oscillator, 150 ohm resistor and electronic voltmeter combination across the input high and low terminals of channel 1 of the ATS.

c. Connect a 150 ohm resistor and the oscilloscope across the output high and low terminals of channel 1 of the ATS.

d. Adjust the audio frequency oscillator to produce a 1000 Hertz, 300 millivolt reading on the electronic voltmeter.

e. Observe the oscilloscope presentation. The signal should appear approximately as shown in figure 4.2-2 and should be between 120 and 160 millivolts rms or 320 and 450 millivolts peak-to-peak. The electronic voltmeter leads may be changed to the output terminals temporarily to check the rms reading if the oscilloscope peak-to-peak reading is marginal.

NOTE

Do not move the 150 ohm resistors on the input and output terminals until the conclusion of the tests on the channel under test.

f. Return the electronic voltmeter leads to the input terminals if they were moved in step e above.

g. Set the level on the audio frequency oscillator to produce a voltmeter reading of 10 millivolts. The reading on the oscilloscope should be less than 5 millivolts peak-to-peak.

h. Set the audio frequency oscillator to again produce a reading of 300 millivolts on the electronic voltmeter. Move the oscilloscope connections to the other three channel output terminals sequentially. The oscilloscope presentation, when the terminals are connected to each set of output terminals of the other three channels, should be less than 5 millivolts peak-to-peak.

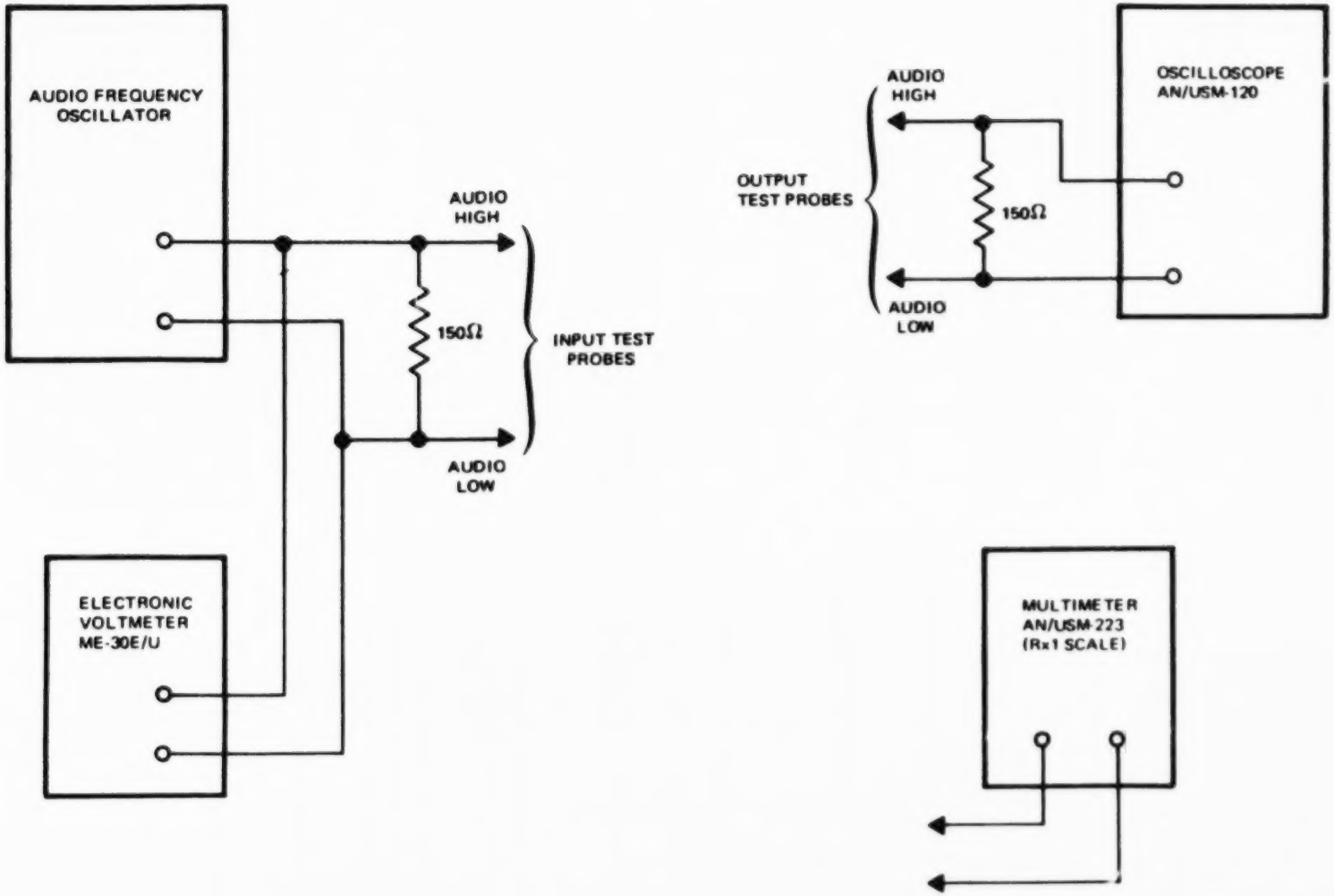
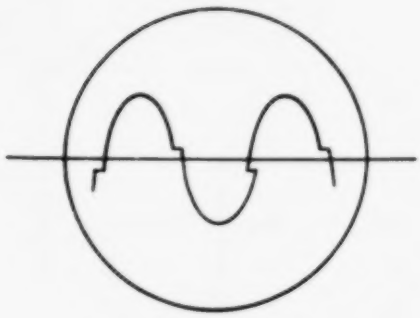


Figure 4.2-1. Audio Threshold Test Setup — Audio Section



FL 1520-210-34-1-TM-C2-21

Figure 4.2-2. Audio Output Waveform

i. Using the multimeter, perform the following measurements:

Terminal	to	Terminal	Indication
J1-S		J1-M	Less than 1 ohm
J1-K		J1-P	Less than 1 ohm
J1-H		J1-D	Less than 1 ohm
J1-B		J1-F	Less than 1 ohm

j. Using the applicable channel terminals specified in step a above, perform steps b through h above on channels 2, 3 and 4 of the ATS.

k. If any portion of the above tests fail to meet requirements specified, refer to applicable audio section troubleshooting procedures for corrective action.

4.2-6. Test Procedures, ATS Control Section

a. Preliminary Test Setup, Control Section (Figure 4.2-3).

(1) Connect ATS terminal J2-P to a common ground point such as the low side of the 28 Vdc power supply.

(2) Connect ATS terminal J2-A through a 1000 ohm resistor to ground.

(3) Connect the multimeter black lead to ground. The red lead will be designated the meter probe for the following tests.

(4) Connect the low side of the 28 Vdc power supply to ground if not already accomplished in step (1) above.

(5) Connect a 28 volt lamp to the high side of the 28 Vdc power supply and connect a probe to the other side of the 28 volt lamp so that the connector terminals of the ATS may be probed as directed in the subsequent tests. This probe will be designated the lamp probe.

(6) Connect a probe to the ground point. This probe will be designated the ground probe.

(7) Connect the 28 Vdc power supply high side terminal to ATS terminal J2-D.

b. Testing, Control Section.

(1) Utilize the following test chart for testing the control section. Sequentially position the test setup ground probe on the terminals indicated by the ground probe column of the test chart. At each step of the tests, position the test setup meter probe on ATS terminals J2-f, J2-T, J2-V and J2-U, in order. Also at each step of the tests, position the test setup lamp probe on terminals J2-F, J2-G, J2-E and J2-h, in order. Compare the test results with the performance standards specified in the test chart.

(2) On the following test chart, an X in the meter probe columns indicates a reading of less than one ohm on the multimeter while the test setup meter probe is connected to that terminal. The absence of an X in the meter probe columns indicates a reading of 1000 ± 100 ohms while test setup meter probe is connected to that terminal. An X in the lamp probe columns indicates the test setup lamp must illuminate while connected to that terminal. The absence of an X in the lamp probe columns indicates the test setup lamp must not illuminate while connected to that terminal.

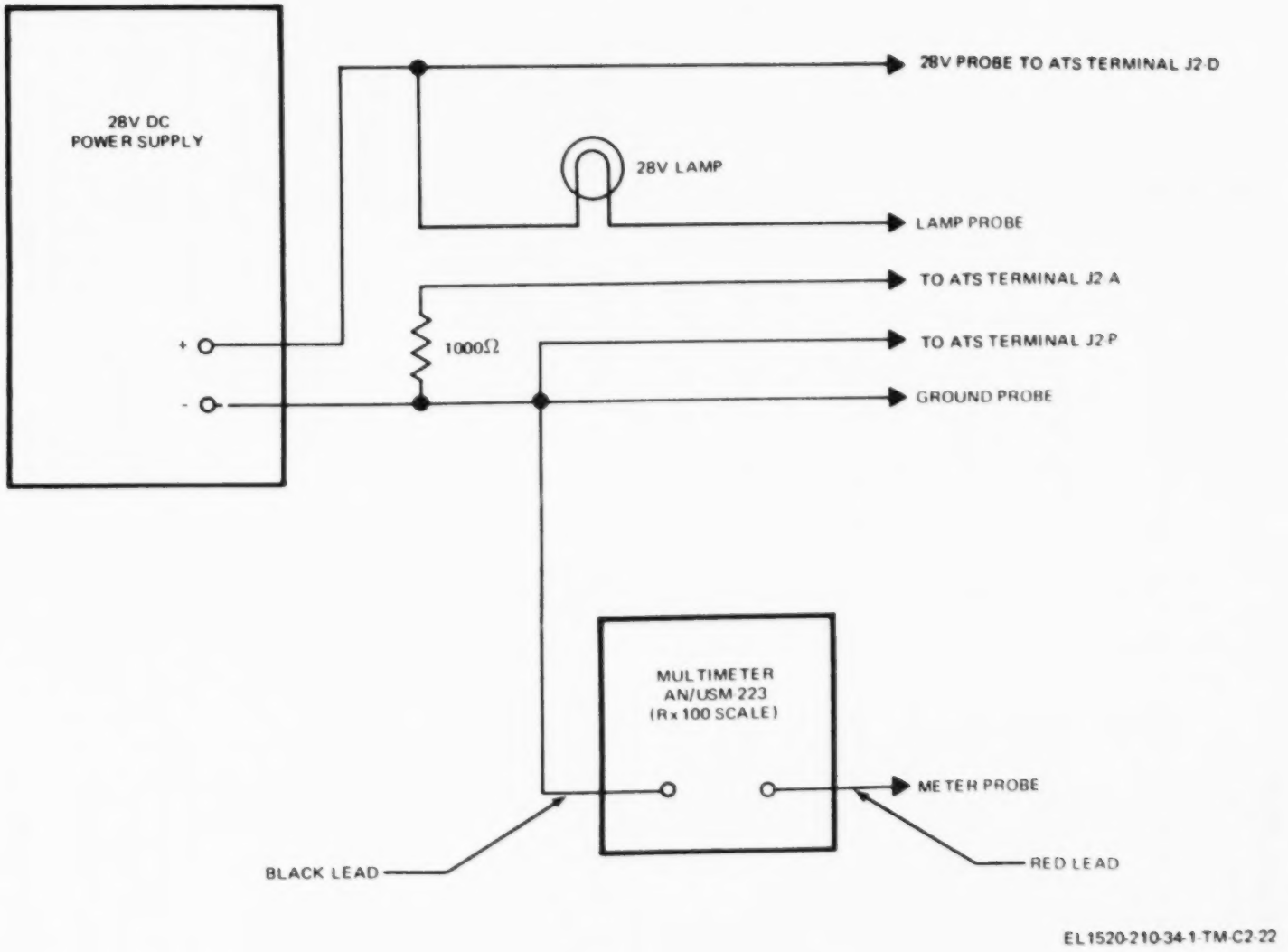


Figure 4.2-3. Audio Threshold Test Setup — Control Section

Step No.	Ground probe to terminal	Meter probe to terminal f	T	V	U	Lamp probe to terminal F	G	E	h
1	(None)								
2	b				X	X			
3	N			X		X			
4	X		X			X			
5	J	X				X			
6	c				X		X		
7	M			X			X		
8	Y		X				X		
9	R	X					X		
10	d				X			X	
11	L			X				X	
12	Z		X					X	
13	S	X						X	
14	e				X				X
15	K			X					X
16	a		X						X
17	W	X							X

(3) If any portion of the above tests fail to meet requirements specified, refer to applicable control section troubleshooting procedures for corrective action.

NOTE

The following troubleshooting procedures are presented separately for the audio section and the control section, conforming with test procedures presentation.

4.2-7. Troubleshooting ATS Audio Section

a. General. Utilize audio threshold detector internal schematic (figure FO-2) with the following troubleshooting chart to perform ATS audio section troubleshooting.

NOTE

Input transformers and capacitors have odd numbered component reference designations (T1, C1, T3, etc.). Output transformers and capacitors have even numbered component reference designations (T2, C2, T4, etc.).

b. ATS Audio Section Troubleshooting Chart.

Symptom	Probable cause	Corrective measures
1. Inadequate input signal.	Shorted input or output capacitor or transformer.	Perform continuity checks and replace defective part.
2. Inadequate output signal.	a. Shorted input or output capacitor or transformer.	a. Perform continuity checks and replace defective part.

Symptom	Probable cause	Corrective measures
	b. Open circuit in input or output transformer or signal diode.	b. Perform continuity checks and replace defective part.
3. Excessive output.	Defective transformer.	Perform continuity checks and replace defective part.
4. Distorted output.	Open signal diode.	Perform resistance measurements and replace defective diode.
5. No low signal isolation.	Shorted signal diode.	Perform resistance measurements and replace defective diode.
6. Inadequate isolation between channels.	Defective wiring in circuit board assembly.	Perform continuity checks and replace or repair defective wiring.

4-2-8. Troubleshooting ATS Control Section

a. General. If trouble has been encountered during bench testing of the ATS control section (paragraph 4-2-6), repeat the tests and note the pattern of discrepancies. Compare the discrepancies with the failure patterns listed in the following discrepancy chart to isolate the defective component. The failure patterns contained in the discrepancy chart are consistent with a single component failure. If more than one failure exists, it will be necessary to troubleshoot using the audio threshold detector internal schematic (figure FO-2) and the multimeter. Open circuit board wiring or poor solder joints can also appear to be a component failure. If replacing the part indicated by the discrepancy chart does not correct the fault, perform continuity checks and replace or repair defective wiring.

b. ATS Control Section Discrepancy Chart.

Failed step(s) of test chart (para. 4-2-5)	Failure indication	Defective component
1	f reads low	K1
1	T reads low	K2
1	V reads low	K3
1	U reads low	K4
2 only	U reads high	CR1
2 only	F does not light	CR17
2, 3, 4	U reads low	CR29
2, 3, 5	T reads low	CR25
2, 4, 5	V reads low	CR21
2, 6, 10	h lights	CR4
2, 6, 14	E lights	CR3
2, 10, 14	G lights	CR2
2, 6, 10, 14	U reads high	K4
3 only	V reads high	CR5
3 only	F does not light	CR21
3, 4, 5	U reads low	CR17
3, 7, 11	h lights	CR8
3, 7, 11, 15	V reads high	K3
3, 7, 15	E lights	CR7
3, 11, 15	G lights	CR6
4 only	T reads high	CR9
4 only	F does not light	CR25
4, 8, 12	h lights	CR12
4, 8, 12, 16	T reads high	K2
4, 8, 16	E lights	CR11
4, 12, 16	G lights	CR10
5 only	f reads high	CR13
5 only	F does not light	CR29

Failed step(s) of test chart (para. 4.2-5)	Failure indication	Defective component
5, 9, 13	h lights	CR16
5, 9, 17	E lights	CR15
5, 9, 13, 17	f reads high	K1
5, 13, 17	G lights	CR14
6 only	U reads high	CR2
6 only	G does not light	CR18
6, 7, 8	f reads low	CR30
6, 7, 9	T reads low	CR26
6, 8, 9	V reads low	CR22
6, 10, 14	F lights	CR1
7 only	V reads high	CR6
7 only	G does not light	CR22
7, 8, 9	U reads low	CR18
7, 11, 15	F lights	CR5
8 only	T reads high	CR10
8 only	G does not light	CR26
8, 12, 16	F lights	CR9
9 only	f reads high	CR14
9 only	G does not light	CR30
9, 13, 17	F lights	CR13
10 only	U reads high	CR3
10 only	E does not light	CR19
10, 11, 12	f reads low	CR31
10, 11, 13	T reads low	CR27
10, 12, 13	V reads low	CR23
11 only	V reads high	CR7
11 only	E does not light	CR13
11, 12, 13	U reads low	CR19
12 only	T reads high	CR11
12 only	E does not light	CR27
13 only	f reads high	CR15
13 only	E does not light	CR31
14 only	U reads high	CR4
14 only	h does not light	CR20
14, 15, 16	f reads low	CR32
14, 15, 17	T reads low	CR28
14, 16, 17	V reads low	CR24
15 only	V reads high	CR8
15 only	h does not light	CR24
15, 16, 17	U reads low	CR20
16 only	T reads high	CR12
16 only	h does not light	CR28
17 only	f reads high	CR16
17 only	h does not light	CR32

Section III. MAINTENANCE PROCEDURES, AUDIO THRESHOLD SYSTEM DETECTOR

4.2-9. General

The maintenance procedures in this section are prepared for use by maintenance shops and supporting organizations responsible for performing general support maintenance of the audio threshold system detector.

4.2-10. Disassembly, ATS Detector

Disassemble the ATS components in accordance with the following procedures and figures 4.2-4 and 4.2-5.

a. Remove the cover from the chassis by removing the five screws, five lockwashers and five flat washers. Lift cover from the ATS.

b. Remove the circuit board assembly from the chassis by first removing the eight screws, eight lockwashers and eight hex nuts securing receptacles J1 and J2 to the chassis; then remove the five screws, five lockwashers and five flatwashers securing the circuit board to the chassis. Lift circuit board assembly from the chassis.

c. The nameplate should not require removal from the cover except for damage. If required, the nameplate peels off the cover.

d. Further disassembly is accomplished by unsoldering connection of parts mounted to the circuit board assembly (figure 4.2-5). Disassemble only to the extent required to replace a faulty part.

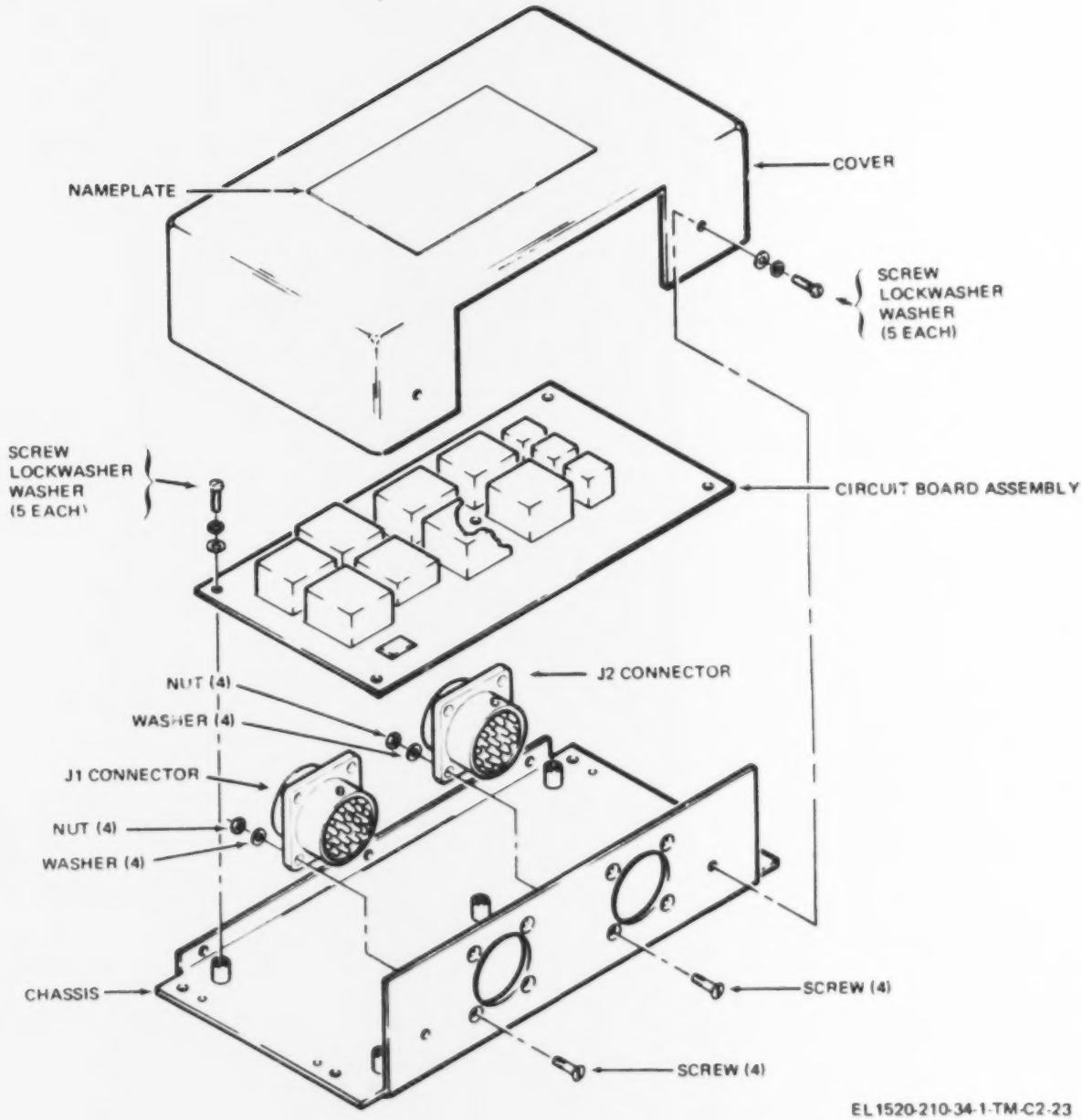


Figure 4.2-4. Audio Threshold Detector — Exploded View

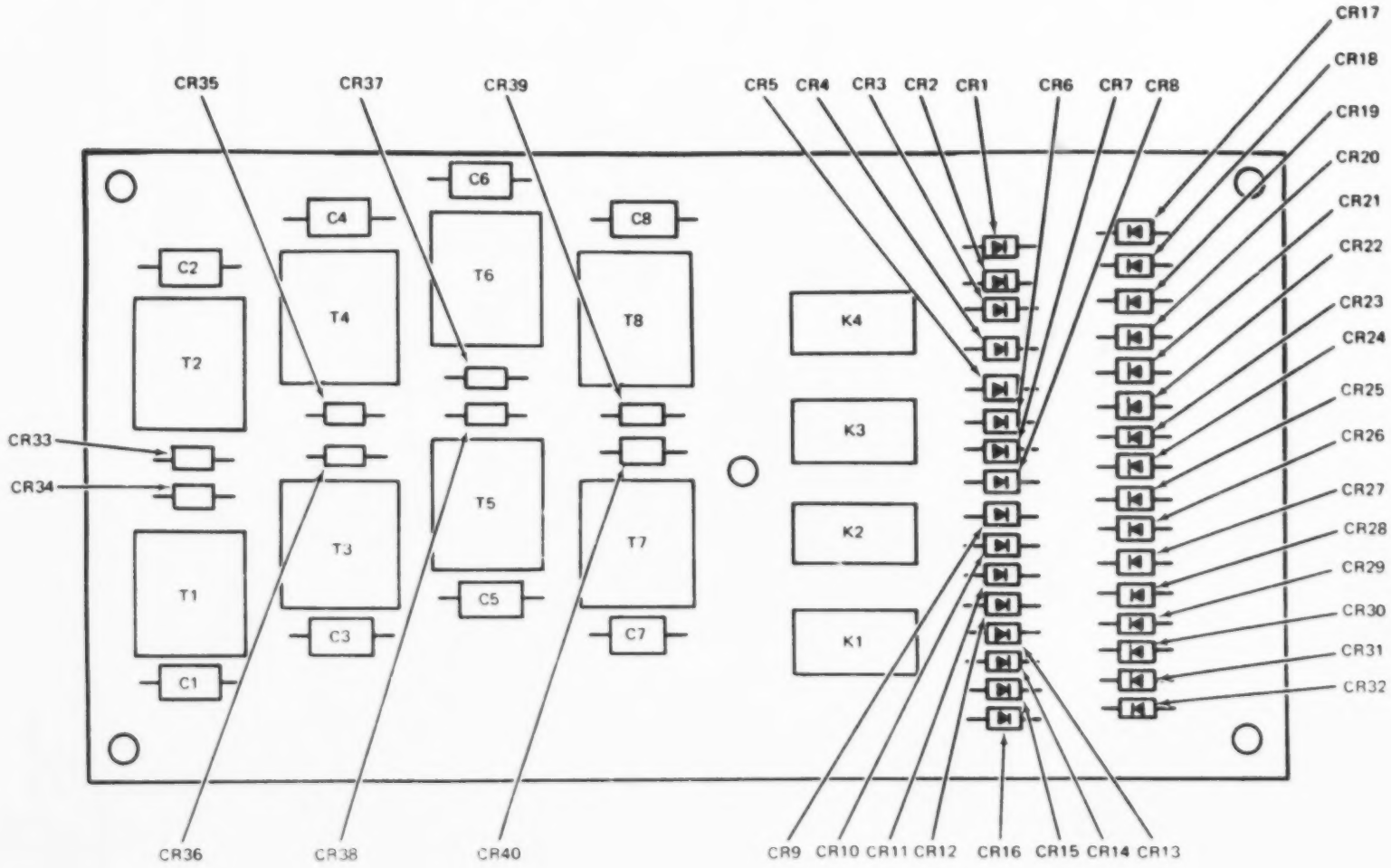


Figure 4.2-5. Audio Threshold Circuit Board Assembly

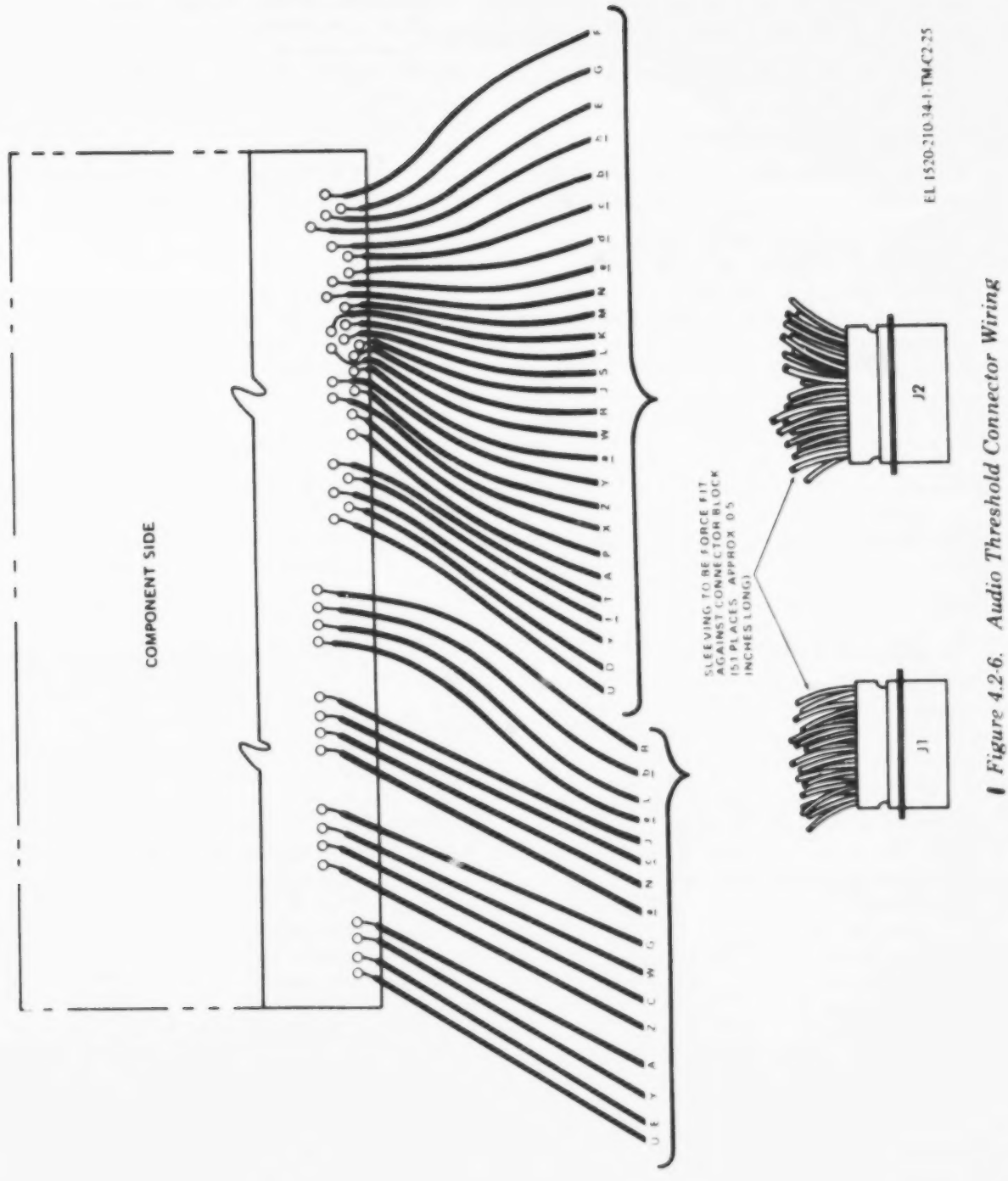

COMPONENT SIDE
U D V I T A P X Z Y E W R J S L K M N H d f c b A i E G F
U E Y A Z C W G H N C J S L b R
SLEEVING TO BE FORCE FIT AGAINST CONNECTOR BLOCK (51 PLACES APPROX 0.5 INCHES LONG)
J2
J1
EL 1520-210-34-1-TM-C2-25

Figure 4.2-6. Audio Threshold Connector Wiring

To remove the connectors J1 and J2, when required for repair, unsolder the leads to the circuit board assembly. See figures 4.2-6 and FO-2 for connector wiring information.

e. Refer to figure 4.2-5 to locate parts when replacement of a faulty part is found to be necessary. Parts are coated with Polyurethane, MIL-I-46058, Type PUR. It will be necessary to remove the coating when replacing a part.

4.2-11. Cleaning, ATS Detector

a. Remove moisture, dust and loose dirt with a clean, soft cloth.

WARNING

Adequate ventilation should be provided while using TRICHLOROTRIFLUOROETHANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame; the products of decomposition are toxic and irritating. Since TRICHLOROTRIFLOUROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

b. Remove greases, fungus, and ground-in dirt from the ATS detector unit and mountings with a clean cloth dampened (not wet) with trichloroethane, technical, liquid form (methyl chloroform), Federal Specification O-T-620, Type I.

c. Remove dust and dirt from all exposed connectors with a bristle brush. Remove moisture from exposed connectors with a clean, dry, lint-free cloth.

4.2-12. Inspection, ATS Detector

The following chart specifies inspection and repair requirements of disassembled parts. Inspect parts for damage, wear or deterioration and repair or replace parts that fail to meet inspection requirements.

Item	Inspect for	Repair
Cover	Punctures, deep dents, and damage to finish requiring touch up.	Touchup or replace.
Chassis	Punctures, deep dents, damaged fasteners and damage to finish requiring touchup.	Touchup or replace.
Circuit board assembly:		
Printed circuit board	Cracked board or damaged surface coating.	Replace or recoat.
Solder joints	Loose or cold solder joints.	Resolder.
Connectors	Insert damage.	Replace connector.
Parts on circuit board assembly	Physical damage.	Replace part.

4.2-13. Assembly, ATS Detector

Reassemble the ATS components in accordance with the following procedures and figures 4.2-4 and 4.2-5.

a. Remount removed or replaced components on the circuit board assembly in the same location and orientation from which they were removed (figure 4.2-5). During reassembly, use the same mounting hardware removed during disassembly (paragraph 4.2-10).

b. Mount the circuit board assembly on the chassis so that the circuit board assembly mounting holes and the chassis mounting nuts align. Secure the circuit board assembly to the chassis using the five screws, five lockwashers and five flat washers removed during disassembly. Secure the connectors to the chassis using the eight screws, eight lockwashers and eight hex nuts removed during disassembly.

c. Place the cover on the chassis. Secure the cover to the chassis using the five screws, five lockwashers and five flat washers removed during disassembly.

APPENDIX A

REFERENCES

The manuals listed below for the electronic equipment configuration in UH-1H helicopters supplement data contained in this manual.

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8, and 9), Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	U. S. Army Equipment Index of Modification Work Orders.
SB 11-573	Painting and Preservation of Supplies Available for Field Use for Electronics Command Equipment.
TB 43-0118	Field Instructions for Painting and Preserving Electronics Command Equipment Including Camouflage Pattern Painting of Electrical Equipment Shelters.
TM 11-1520-210-20-1	Organizational Maintenance Manual: Electronic Equipment Configurations: Army Model UH-1H Helicopter (W/Standard Lightweight Avionics Equipment).
TM 11-1520-210-34P	DS and GS Maintenance Repair Parts and Special Tools Lists (Including Depot Maintenance Repair Parts and Special Tools) for Electronic Equipment Configurations for Army Model UH-1D and UH-1H Helicopters.
TM 11-5820-518-20	Organizational Maintenance Manual: Radio Set AN/ARC-51X and AN/ARC-51BX.
TM 11-5820-518-35	DS, GS and Depot Maintenance Manual: Radio Sets AN/ARC-51X (NSN 5821-00-082-3698) and AN/ARC-51BX (5821-00-082-3926).
TM 11-5821-244-12	Operator's and Organizational Maintenance Manual for Radio Set AN/ARC-54 (FSN 5831-082-3598).
TM 11-5821-244-34	DS and GS Maintenance Manual: Radio Set, AN/ARC-54 (NSN 5821-00-082-3598).
TM 11-5821-248-12	Operator's and Organizational Maintenance Manual: Radio Set AN/ARC-102 (NSN 5821-00-050-8255).
TM 11-5821-248-35	DS, GS and Depot Maintenance Manual: Radio Set AN/ARC-102 (NSN 5821-00-050-8255).
TM 11-5821-259-20	Organizational Maintenance Manual: Radio Sets AN/ARC-114 and AN/ARC-114A; Network, Impedance Matching, CU-1794/ARC-114; Network, Impedance Matching-Quadrature Hybrid, CU-1796/ARC-114.
TM 11-5821-260-20	Organizational Maintenance Manual: Radio Set AN/ARC-115.
TM 11-5821-262-20	Organizational Maintenance Manual: Control, Communication System, C-6533/ARC.
TM 11-5826-211-50	Depot Maintenance Manual: Radio Magnetic Indicator ID-250A/ARN.
TM 11-5826-219-12	Operator and Organizational Maintenance Manual: Receivers, Radio R1041/ARN and R1041A/ARN and R-1041B/ARN.

TM 11-5826-219-35	DS, GS, and Depot Maintenance Manual: Receivers, Radio R-1041/ARN and R-1041A/ARN and R-1041B/ARN (No B model in Index).
TM 11-5826-225-12	Operator and Organizational Maintenance Manual: Direction Finder Set AN/ARN-83 (NSN 5826-00-912-4415).
TM 11-5826-225-35	DS, GS, and Depot Maintenance Manual: Direction Finder Set AN/ARN-83 (NSN 5826-00-912-4415).
TM 11-5826-226-20	Organizational Maintenance Manual: Radio Receiving Set AN/ARN-82 (NSN 5826-00-402-5318) AN/ARN-82A (5826-00-168-8699) and AN/ARN-82B (5826-00-168-8699).
TM 11-5826-226-34	DS, GS, and Depot Maintenance Manual: Radio Receiving Sets AN/ARN-82 (NSN 5826-00-402-5318), AN/ARN-82A and AN/ARN-82B (5826-00-168-8699).
TM 11-5826-257-24	Organizational, DS, and GS Maintenance Manual: Radio Receiver, R-1963/ARN (NSN 5826-01-015-1574).
TM 11-5826-258-24	Organizational, DS and GS Maintenance Manual: Radio Receiving Sets, AN/ARN-123(V)1 (NSN 5826-01-016-2762), AN/ARN-123(V)2 (5826-01-016-2761), AN/ARN-123(V)3 (5826-01-058-6800) and AN/ARN-123(V)4 (5826-01-070-4067).
TM 11-5841-268-25	Organizational/Field/Intermediate/DS, GS and Depot Maintenance with Illustrated Parts Breakdown: Control, Transponder Set C-6280(P)/APX, C-6280A-(P)/APX, C-6717/APX, and C-7483/APX (TO 12P4-2APX-142, NAVAIR 16-35C6280-1).
TM 11-5841-284-23&P	Organizational and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List): Altimeter Set, Electronic, AN/APN-209(V)1 and AN/APN-209(V)2.
TM 11-5895-490-20	Organizational Maintenance Manual: Receiver-Transmitters, Radio RT-859/APX-72 and RT-859A/APX-72 and Mountings MT-3809/APX-72 and MT-3948/APX-72 (NAVSHIPS 0967-217-4010).
TM 11-5895-555-24	Organizational Direct Support and General Support Maintenance Manual: Control Indicator C-8157/ARC and Mounting MT-3802/ARC.
TM 11-6110-211-15	Organizational, DS, GS, and Depot Maintenance Manual (Including Repair Parts and Special Tools Lists): Amplifier, Electronic Control, AM-3209/ASN.
TM 11-6125-220-20	Organizational Maintenance Manual: Motor-Generators PU-543/A (NSN 6125-00-062-7483), PU-543A/A (6125-00-884-5261), PU-543B/A (6125-00-863-9683), PU-543C/A (6125-00-938-6539), and PU-543D/A (6125-00-938-6539).
TM 11-6140-203-15-1	Operator, Organizational, DS, GS, and Depot Maintenance Manual: Aircraft and Nonaircraft Nickel-Cadmium Batteries (General).
TM 11-6140-203-15-3	Operator's Organizational, DS, GS, and Depot Maintenance Manual (Including Repair Parts and Special Tool List): Non-Aircraft Nickel-Cadmium Batteries.

TM 11-6605-202-12	Operator's and Organizational Maintenance Manual: Gyromagnetic Compass Set AN/ASN-43.
TM 11-6605-202-35	DS, GS, and Depot Maintenance Manual: Gyromagnetic Compass Set AN/ASN-43.
TM 11-6625-203-12	Operator's and Organizational Maintenance: Multimeter AN/URM-105 and AN/URM-105C (Including Multimeter ME-77/U and ME-77C/U).
TM 11-6625-446-15	Operator's, Organizational, DS, GS, and Depot Maintenance Manual: Wattmeter AN/URM-120.
TM 38-750	The Army Maintenance Management System (TAMMS).
TM 43-0139	Painting Instructions for Field Use.
TM 55-1500-323-25	Organizational, DS, GS and Depot Maintenance Manual: Installation Practices for Aircraft Electric and Electronic Wiring.
TM 55-1520-220-10	Operator's Manual: Army Model UH-1C/M Helicopter.
TM 55-1520-220-20	Organizational Maintenance Manual: Army Model UH-1C/M Helicopter.

APPENDIX B

GLOSSARY

Section I. ABBREVIATIONS

ac	Alternating current	inph	Interphone
adf	Automatic direction finder	max	Maximum
af	Audio frequency	mkr bcn	Marker beacon
am	Amplitude modulation	nav	Navigation
ant	Antenna	omni	Omnirange
ats	Audio Threshold System	ptt	Press to talk
att	Attitude	rcvr	Receiver
aux	Auxiliary	rf	Radio frequency
bat	Battery (electrical)	rfi	Radio frequency interference
bfo	Beat-frequency oscillator	squel	Squelch
dc	Direct current	ssb	Single side band
fm	Frequency modulation	trans	Transmission
freq	Frequency	uhf	Ultra high frequency
gs	Glideslope	vac	Volts alternating current
hf	High frequency	var	Visual aural radio range
hz	Hertz	vdc	Volts direct current
ics	Interphonecommunication system	vhf	Very high frequency
if	Intermediate frequency	vol	Volume
iff	Identification friend or foe	vor	VHF omni range
ils	Instrument landing system	xmtr	Transmitter

Section II. DEFINITION OF UNUSUAL TERMS

The list of unusual terms and their definitions are as follows:

Aft—At, near, or toward the rear of a helicopter; also the rear section of a helicopter.

Airframe—Structural components of a helicopter including the framework and the skin.

Attitude—The aspect that a helicopter presents at any given moment, as determined by its inclinations about its three axes.

Automatic direction finder—Radio compass facility which permits automatic indication of the direction of the station to which it is tuned.

Basic signal electronic equipment—Equipment for which the Electronic Command has logistic and maintenance responsibility and for which there are DA publications covering troubleshooting, testing, aligning, and repairing of the equipment through replacing maintenance parts and repairing specific maintenance parts. These equipments are used without modification in more than one helicopter and are government furnished to the helicopter manufacturer for installation.

Bearing—Position of a helicopter with respect to true or magnetic north. Measured in degrees, 0 to 360.

Bus—A conductor or group of conductors which serve as a common connection for two or more circuits.

Compass rose—A graduated circle marked in degrees and/or directions for calibration of helicopter magnetic compasses.

Configuration—A group of various equipments interconnected and interrelated to provide a large system that has numerous functions and capabilities.

Course—A planned route or direction of flight referenced to points on the earth.

Facility—A group of equipments that may be physically separated but are integrated by cables or other interconnections to perform one function.

Flux valve—A direction-sensing element activated by the earth's magnetic field.

Fore—At, near, or toward the front of the helicopter; also the front section of a helicopter.

Glideslope—A radio transmitter placed along the runway that provides vertical guidance to helicopters during its approaches.
Heading—The relative direction in which the helicopter is pointed.
Homing—Navigation toward a point.
Hot mike—Microphone always on (on-push-to-talk function).
Instrument landing system—A system providing visual glidepath information to helicopters during landing approach.
Marker beacon—Radio beacon placed along a runway to indicate the position of the helicopter.
Null—Zero signal indication.
Omnidirectional—In all directions.
Safety wire—Steel wire tied through holes in equipment mounting hardware to keep the equipment securely mounted, regardless of vibrations.
Sidetone—The portion of a signal from a transmitter that is returned to the receiver of the same receiver headset or headset for monitoring communications.
Sense antenna—An antenna used to resolve a 180° ambiguity in a directional antenna.
Slaved—Synchronized with, forced to follow, or duplicate an action.
Station—A measurement in inches from a reference plane near the front of the helicopter, or, a position/location occupied by one of the crew members.
To-from-meter—Indicates the direction a helicopter is heading in relation to a vor station.
Tone Localizer—A transmitted signal with tones that identify the helicopter's direction from the runway during final approach or landing.
Visual-aural range—Radio range that transmits information for visual and aural interpretation in the helicopter. Information enables the pilot to follow prescribed course.

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HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 15 May 1973

TM 11-1520-210-34-1, 15 May 1973, is published for the use of all concerned.

By Order of the Secretary of the Army:

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General, United States Army
Chief of Staff

Official:

VERNE L. BOWERS
Major General, United States Army
The Adjutant General

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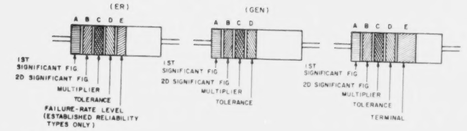
End of Volume.



COLOR CODE MARKING FOR COMPOSITION TYPE RESISTORS

COLOR-CODE MARKING FOR FILM-TYPE RESISTORS

TABLE I

COLOR CODE FOR COMPOSITION TYPE AND FILM TYPE RESISTORS

	BAND A	BAND B		BAND C		BAND D		BAND E		
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)	COLOR	FAILURE RATE LEVEL	TERM
BLACK	0	BLACK	0	BLACK	1			BROWN	M=1.0	
BROWN	1	BROWN	1	BROWN	10			RED	P=0.1	
RED	2	RED	2	RED	100			ORANGE	R=0.01	
ORANGE	3	ORANGE	3	ORANGE	1,000			YELLOW	S=0.001	
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	±10 (COMP TYPE ONLY)	WHITE		SOLDERABLE
GREEN	5	GREEN	5	GREEN	100,000	GOLD	±5			
BLUE	6	BLUE	6	BLUE	1,000,000	RED	±2 (NOT APPLICABLE TO ESTABLISHED RELIABILITY)			
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7							
GRAY	8	GRAY	8	SILVER	0.01					
WHITE	9	WHITE	9	GOLD	0.1					

BAND A — THE FIRST SIGNIFICANT FIGURE OF THE RESISTANCE VALUE (BANDS A THRU D SHALL BE OF EQUAL WIDTH)

BAND B — THE SECOND SIGNIFICANT FIGURE OF THE RESISTANCE VALUE

BAND C — THE MULTIPLIER (THE MULTIPLIER IS THE FACTOR BY WHICH THE TWO SIGNIFICANT FIGURES ARE MULTIPLIED TO YIELD THE NOMINAL RESISTANCE VALUE)

BAND D — THE RESISTANCE TOLERANCE

BAND E — WHEN USED ON COMPOSITION RESISTORS, BAND E INDICATES ESTABLISHED RELIABILITY FAILURE-RATE LEVEL (PERCENT FAILURE PER 1,000 HOURS). ON FILM RESISTORS, THIS BAND SHALL BE APPROXIMATELY 1-1/2 TIMES THE WIDTH OF OTHER BANDS, AND INDICATES TYPE OF TERMINAL.

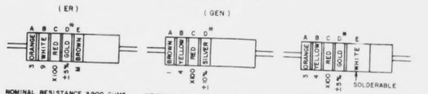
RESISTANCES IDENTIFIED BY NUMBERS AND LETTERS (THESE ARE NOT COLOR CODED)

SOME RESISTORS ARE IDENTIFIED BY THREE OR FOUR DIGIT ALPHA NUMERIC DESIGNATORS. THE LETTER R IS USED IN PLACE OF A DECIMAL POINT WHEN FRACTIONAL VALUES OF AN OHM ARE EXPRESSED. FOR EXAMPLE:

2R7 = 2.7 OHMS 10R0 = 10.0 OHMS

FOR WIRE-WOUND-TYPE RESISTORS COLOR CODING IS NOT USED. IDENTIFICATION MARKING IS SPECIFIED IN EACH OF THE APPLICABLE SPECIFICATIONS.

EXAMPLES OF COLOR CODING



NOMINAL RESISTANCE 3,900 OHMS
RESISTANCE TOLERANCE ±5%
FAILURE RATE LEVEL M

NOMINAL RESISTANCE 1,400 OHMS
RESISTANCE TOLERANCE ±10%

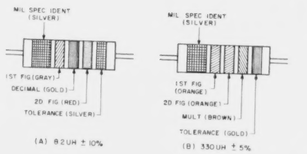
NOMINAL RESISTANCE 3,400 OHMS
RESISTANCE TOLERANCE ±5%
TERMINAL SOLDERABLE

COMPOSITION-TYPE RESISTORS

FILM-TYPE RESISTORS

IF BAND D IS OMITTED, THE RESISTOR TOLERANCE IS ±20% AND THE RESISTOR IS NOT MIL-STD

A. COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS



COLOR CODING FOR TUBULAR ENCAPSULATED R.F. CHOKES. AT A, AN EXAMPLE OF THE CODING FOR AN 8.2 UH CHOKE IS GIVEN. AT B, THE COLOR BANDS FOR A 330 UH INDUCTOR ARE ILLUSTRATED.

TABLE 2

COLOR CODING FOR TUBULAR ENCAPSULATED R.F. CHOKES

COLOR	SIGNIFICANT FIGURE	MULTIPLIER	INDUCTANCE TOLERANCE (PERCENT)
BLACK	0	1	
BROWN	1	10	1
RED	2	100	2
ORANGE	3	1,000	3
YELLOW	4		
GREEN	5		
BLUE	6		
VIOLET	7		
GRAY	8		
WHITE	9		
NONE			20
SILVER			10
GOLD	DECIMAL POINT		5

MULTIPLIER IS THE FACTOR BY WHICH THE TWO COLOR FIGURES ARE MULTIPLIED TO OBTAIN THE INDUCTANCE VALUE OF THE CHOKE COIL

B. COLOR CODE MARKING FOR MILITARY STANDARD INDUCTORS

CAPACITORS, FIXED, VARIOUS-DIELECTRICS, STYLES CM, CN, CY, AND CB

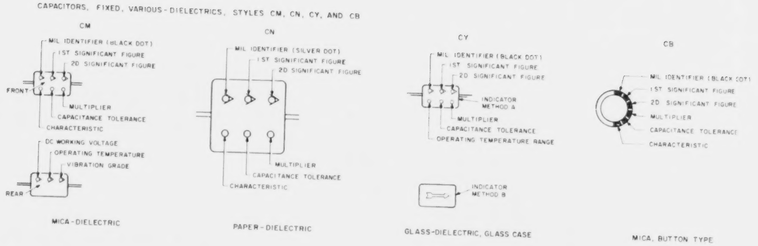
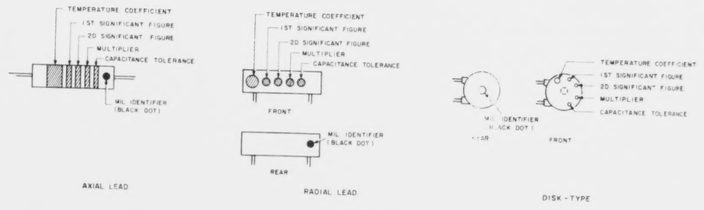


TABLE 3 — FOR USE WITH STYLES CM, CN, CY AND CB

COLOR	MIL ID	1ST SIG FIG	2D SIG FIG	MULTIPLIER	CAPACITANCE TOLERANCE			CHARACTERISTIC[2]			DC WORKING VOLTAGE	OPERATING TEMP RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CB	CM	CN, CM	CM
BLACK	CM, CY, CB	0	0	1			±20%	±20%	A				-55°C to +70°C	10-55 Hz
BROWN		1	1	10					B	E	B			
RED		2	2	100	±2%		±2%	±2%	C				-55°C to +85°C	
ORANGE		3	3	1,000		±30%			D		D	300		
YELLOW		4	4	10,000					F		F		-55°C to +125°C	10-2,000 Hz
GREEN		5	5		±5%				F			500		
BLUE		6	6										-55°C to +150°C	
PURPLE (VIOLET)		7	7											
GREY		8	8											
WHITE		9	9											
GOLD				0.1		±5%	±5%	±5%						
SILVER	CN				±10%	±10%	±10%	±10%						



C. COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

TABLE 4 — TEMPERATURE COMPENSATING, STYLE CC

COLOR	TEMPERATURE COEFFICIENT[4]	1ST SIG FIG	2D SIG FIG	MULTIPLIER	CAPACITANCE TOLERANCE		MIL ID
					CAPACITANCES OVER 10 UUF	CAPACITANCES 10 UUF OR LESS	
BLACK	0	0	0	1		±2.0 UUF	CC
BROWN	-30	1	1	10	±1%		
RED	-80	2	2	100	±2%	±0.25 UUF	
ORANGE	-150	3	3	1,000			
YELLOW	-220	4	4			±0.5 UUF	
GREEN	-330	5	5		±5%		
BLUE	-470	6	6				
PURPLE (VIOLET)	-750	7	7				
GREY		8	8	0.01			
WHITE		9	9	0.1	±10%		
GOLD	+100					±1.0 UUF	
SILVER							

1. THE MULTIPLIER IS THE NUMBER BY WHICH THE TWO SIGNIFICANT (SIG) FIGURES ARE MULTIPLIED TO OBTAIN THE CAPACITANCE IN UUF.
2. LETTERS INDICATE THE CHARACTERISTICS DESIGNATED IN APPLICABLE SPECIFICATIONS: MIL-C-5, MIL-C-250, MIL-C-11272B, AND MIL-C-10950C RESPECTIVELY.
3. LETTERS INDICATE THE TEMPERATURE RANGE AND VOLTAGE-TEMPERATURE LIMITS DESIGNATED IN MIL-C-11015D.
4. TEMPERATURE COEFFICIENT IN PARTS PER MILLION PER DEGREE CENTIGRADE.

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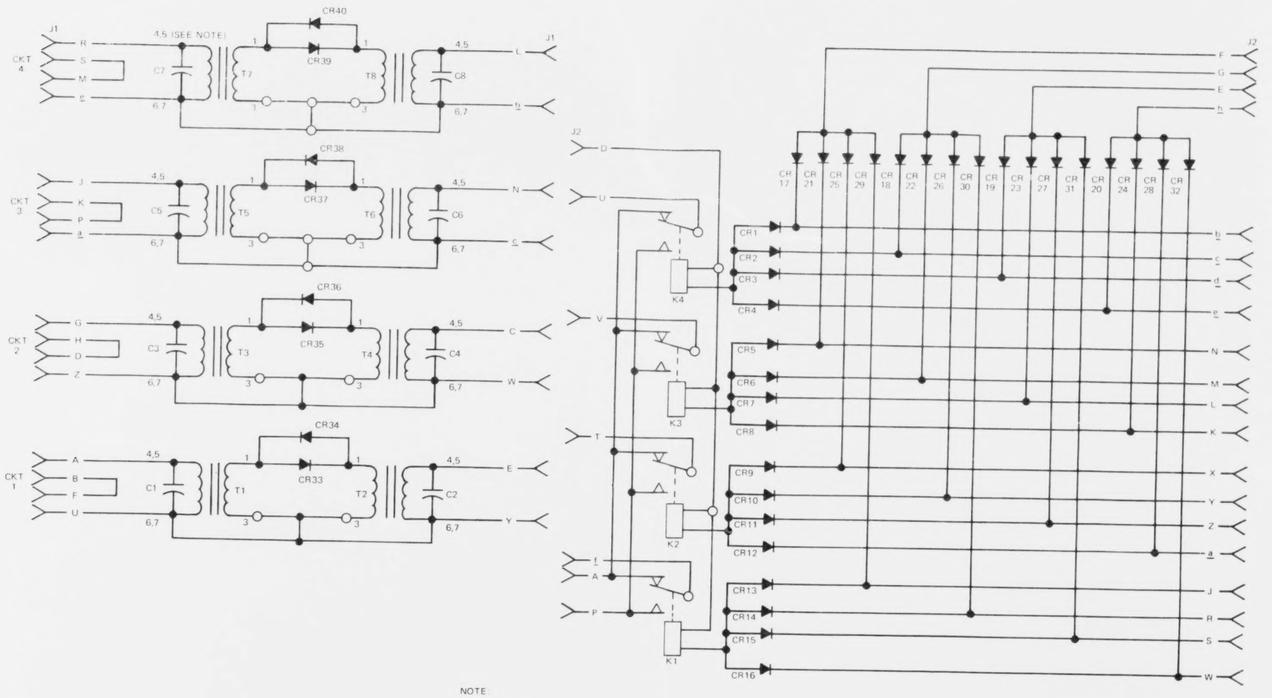


NOTE:

4, 5, 6, 7 INDICATES THAT THE RESPECTIVE TERMINALS ARE BUSSED

EL1520-210-34-1 TM-C2-1

Figure FO-2. Audio Threshold Detector (Internal Schematic)

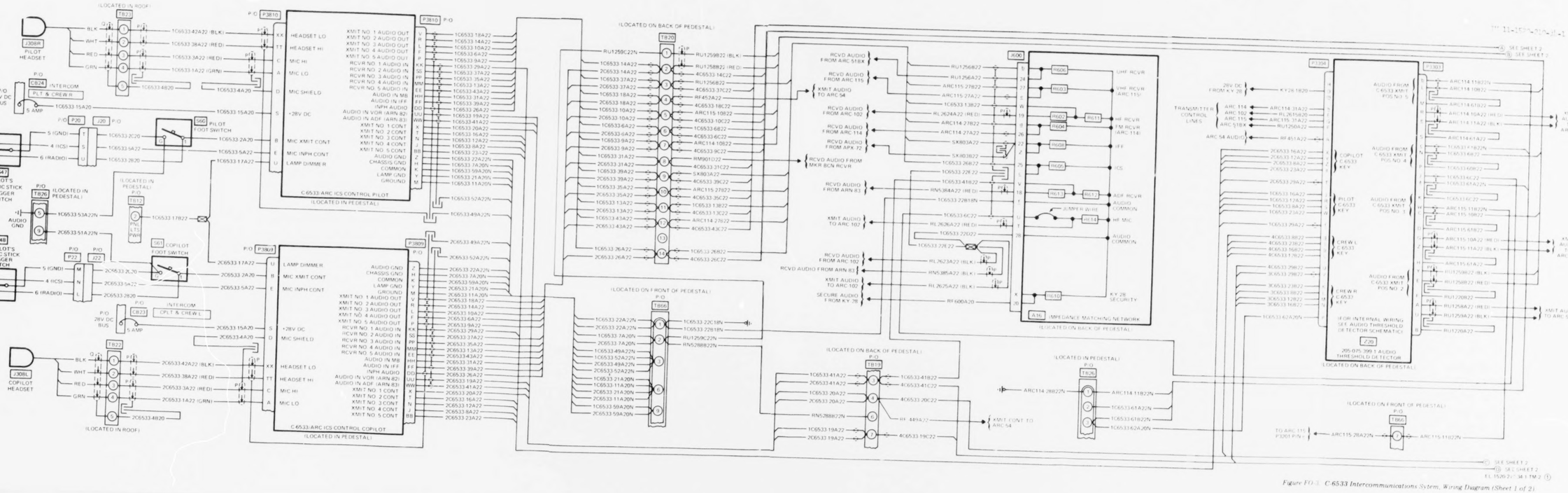


Figure FO-3. C-6533 Intercommunications System, Wiring Diagram (Sheet 1 of 2)

Figure FO-3. C-6533 Intercommunications System, Wiring Diagram (Sheet 2 of 2).

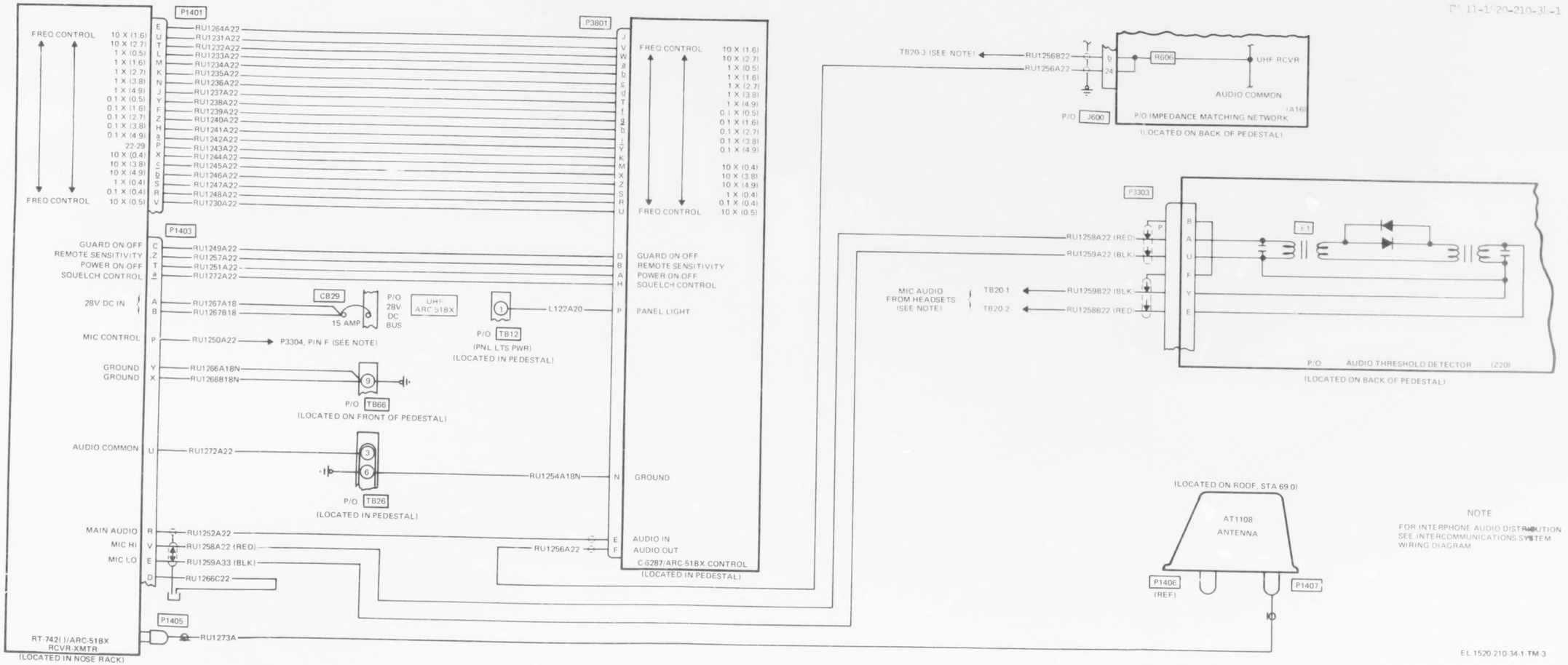
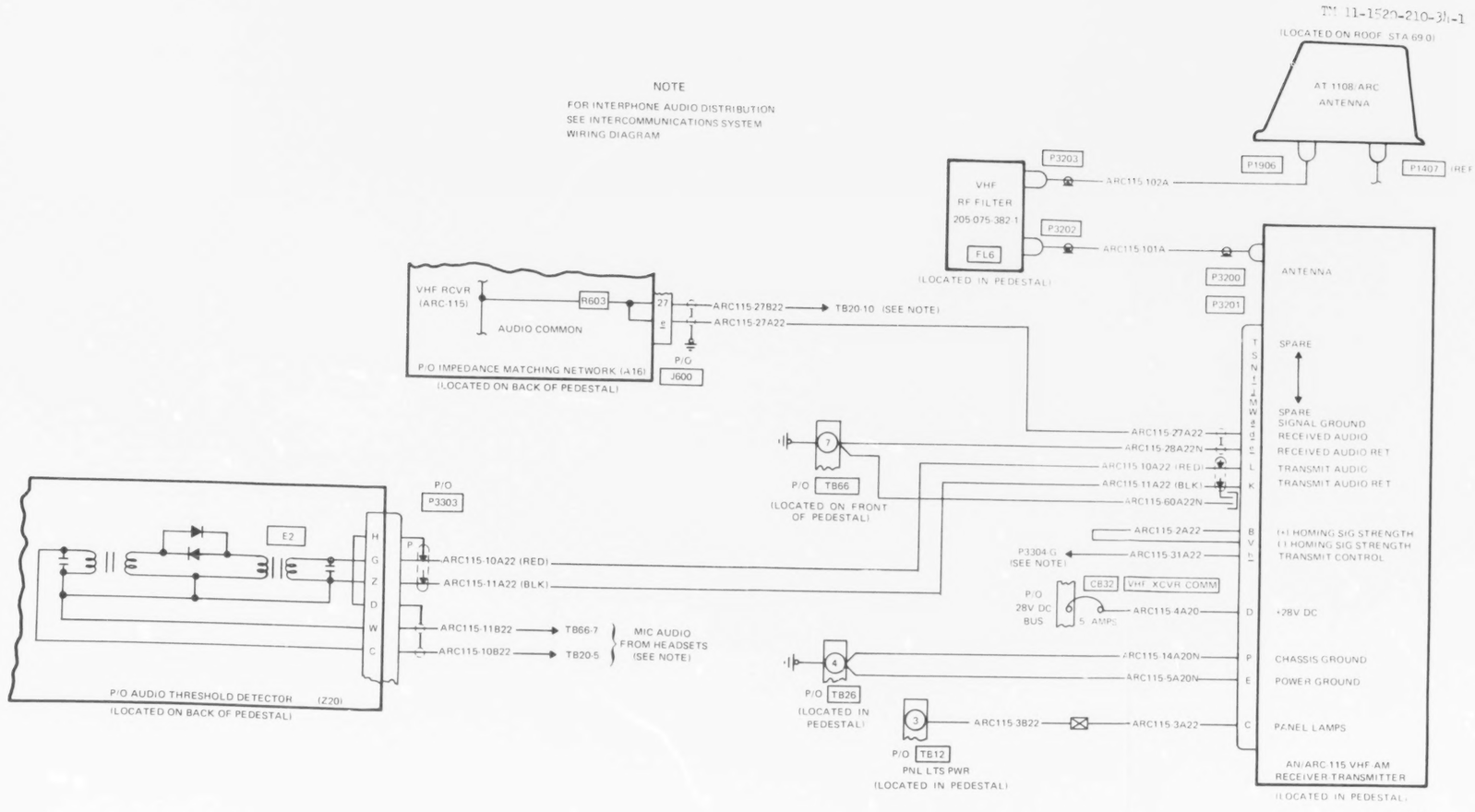


Figure FO-4. UHF Command Facility AN/ARC-51BX Wiring Diagram.



EL 1520-210-34-1-TM-4

Figure FO-5. VHF AM Facility AN/ARC-115 Wiring Diagram.

Figure FO-6. ARC-54 and KY-28 Wiring Diagram (Sheet 1 of 2).

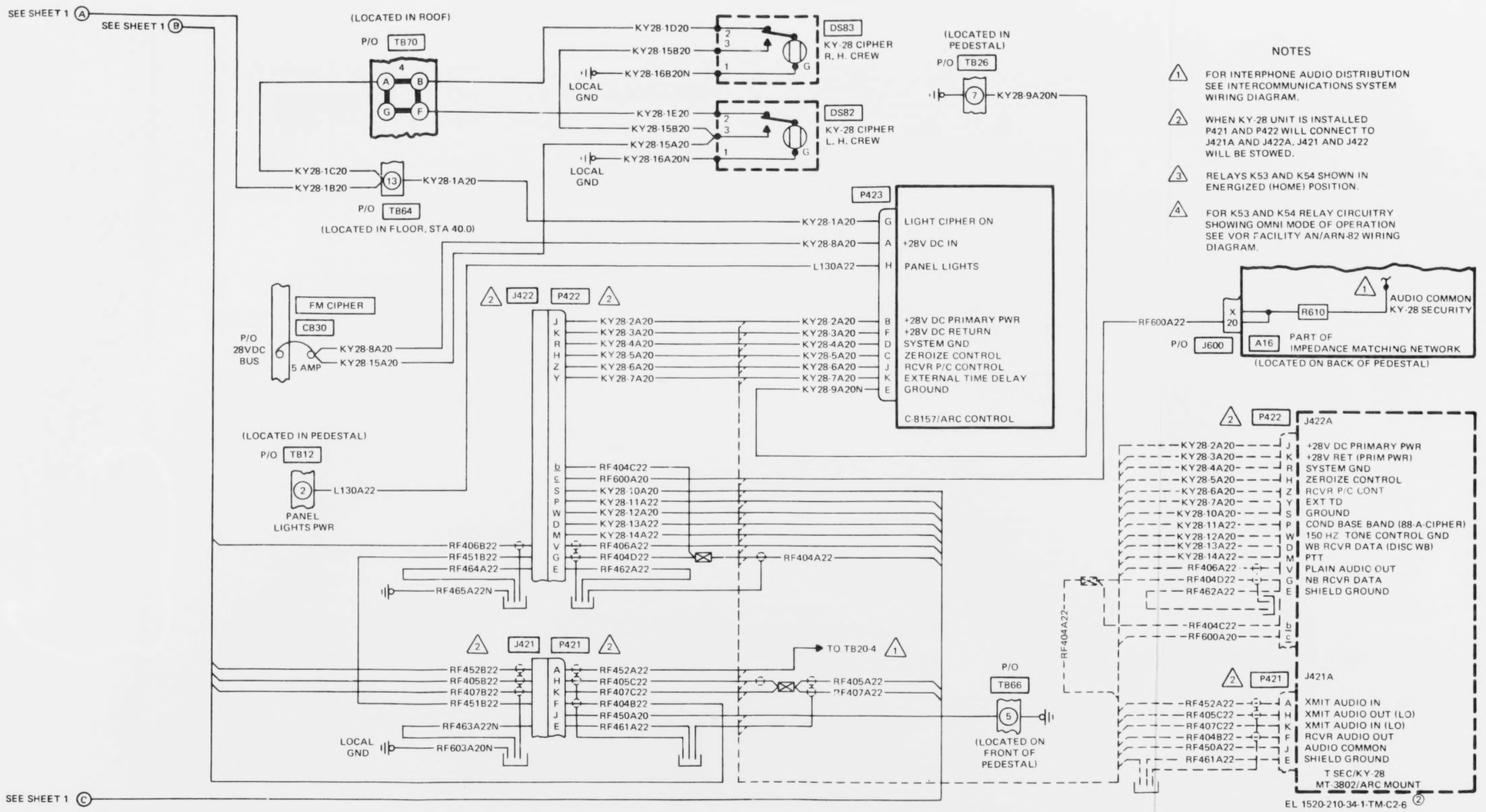


Figure FO-6. ARC-54 and KY-28 Wiring Diagram (Sheet 2 of 2).

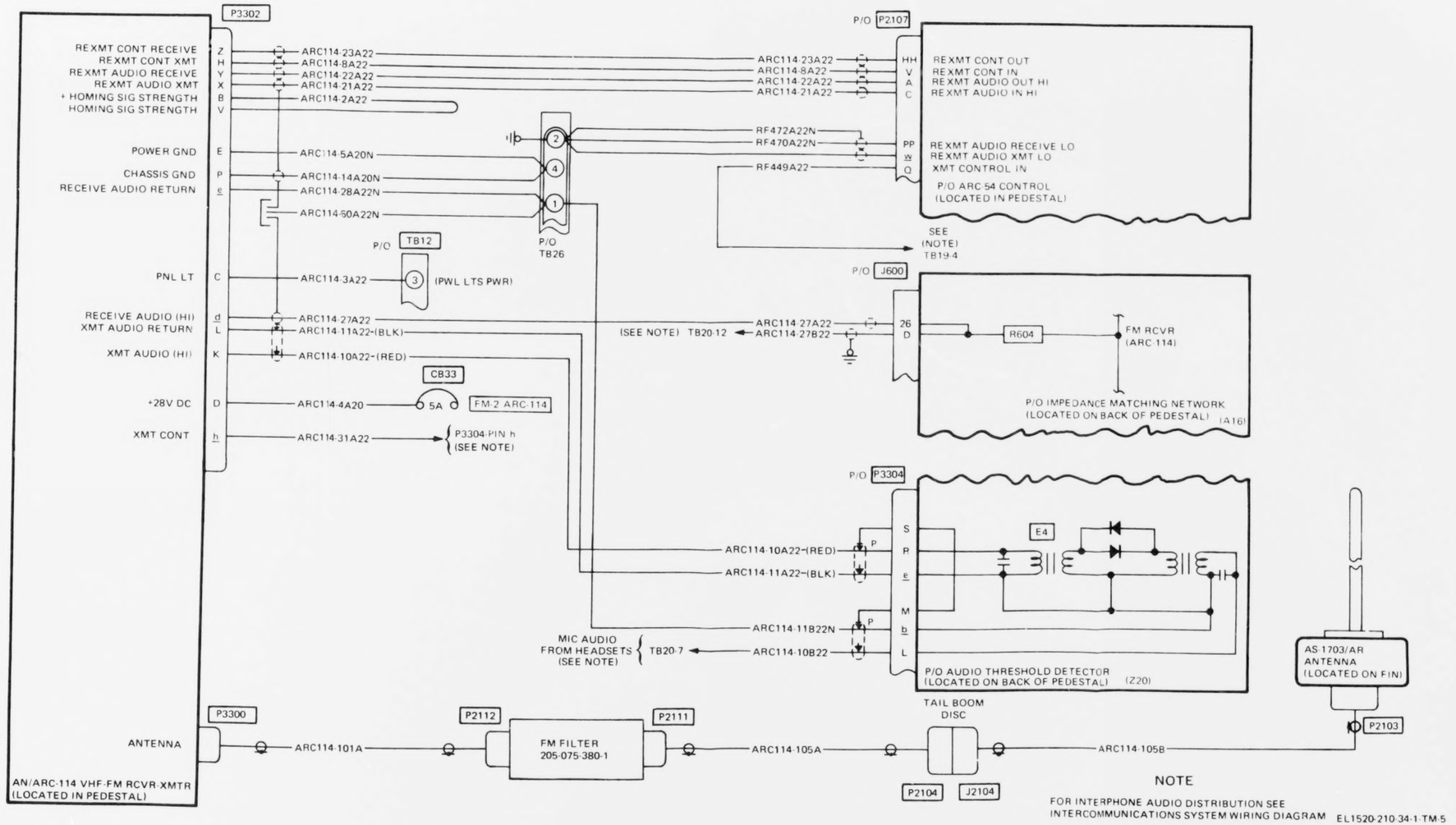


Figure FO-7. VHF FM No. 2 Facility Wiring Diagram.

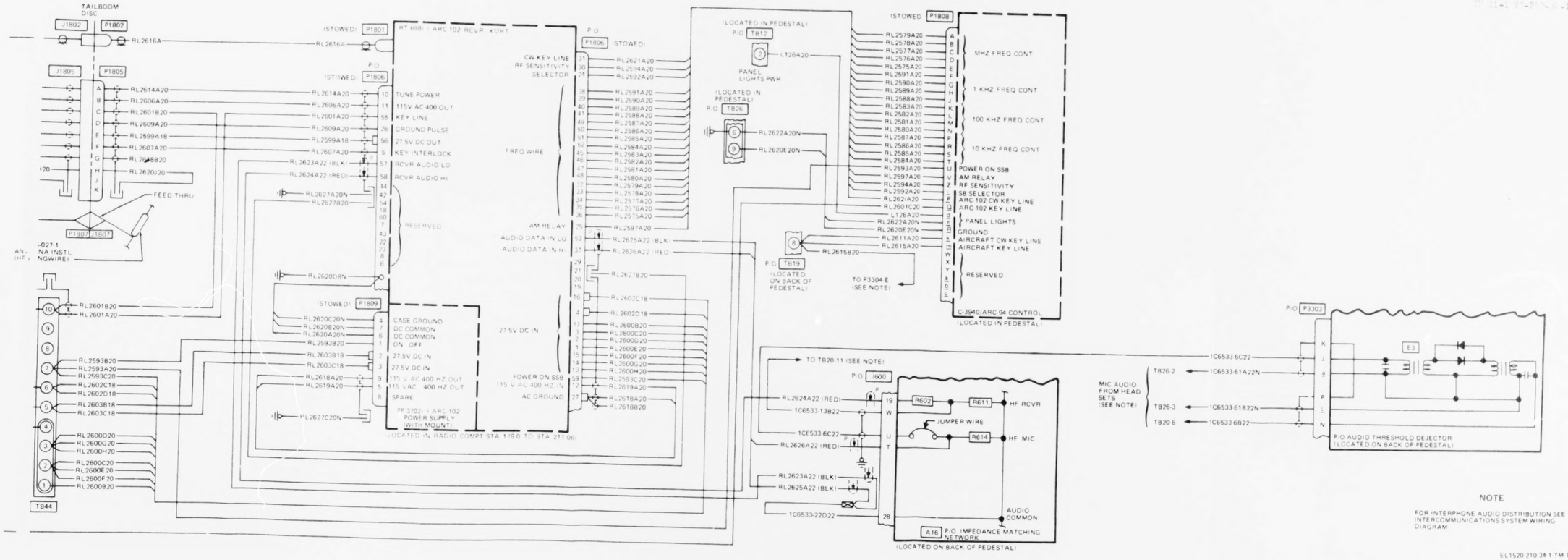


Figure FO-8. HF Facility AN/ARC-102 Wiring Diagram.

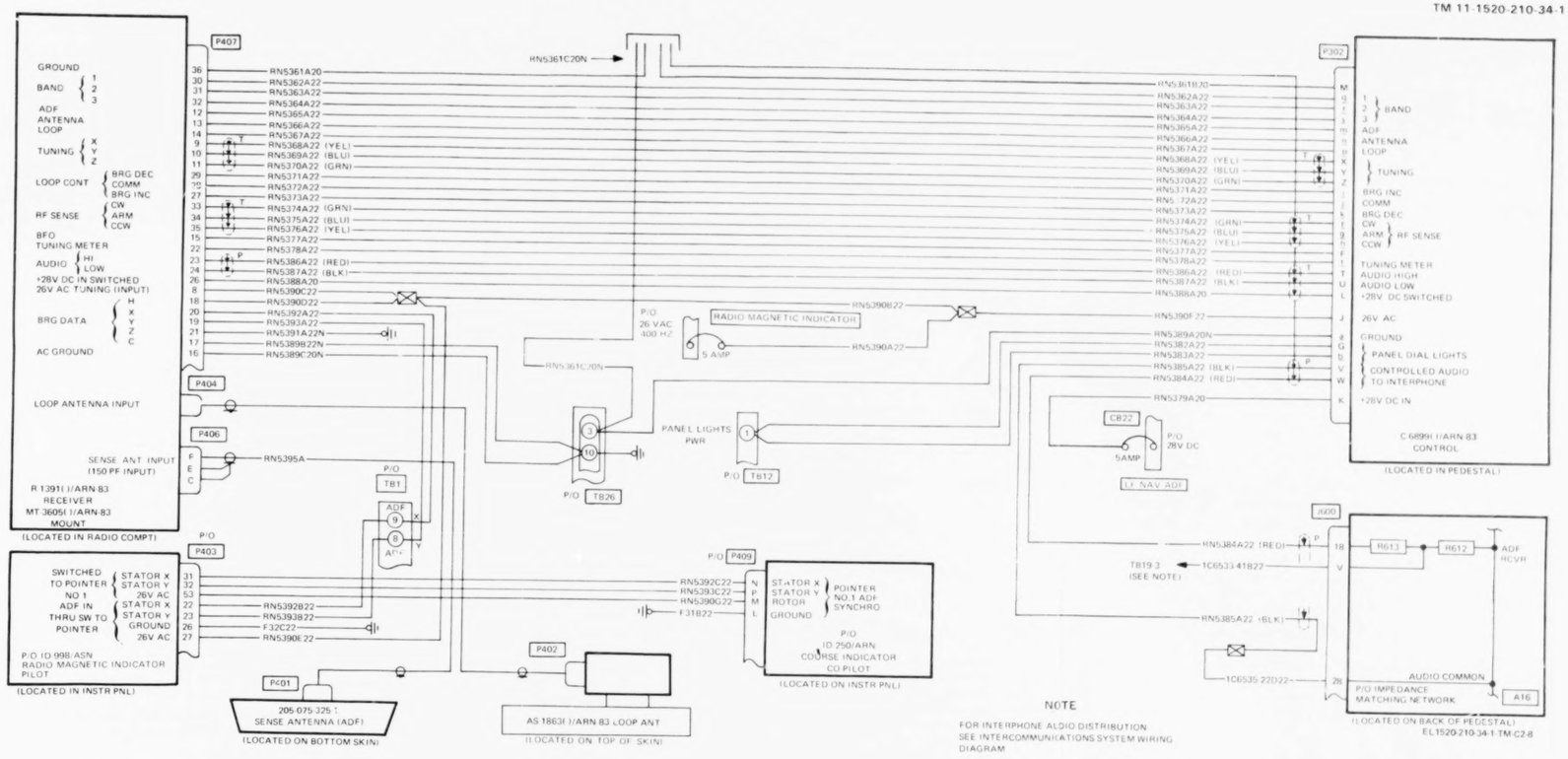


Figure FO-9. ADF Facility AN/ARN-83 Wiring Diagram.

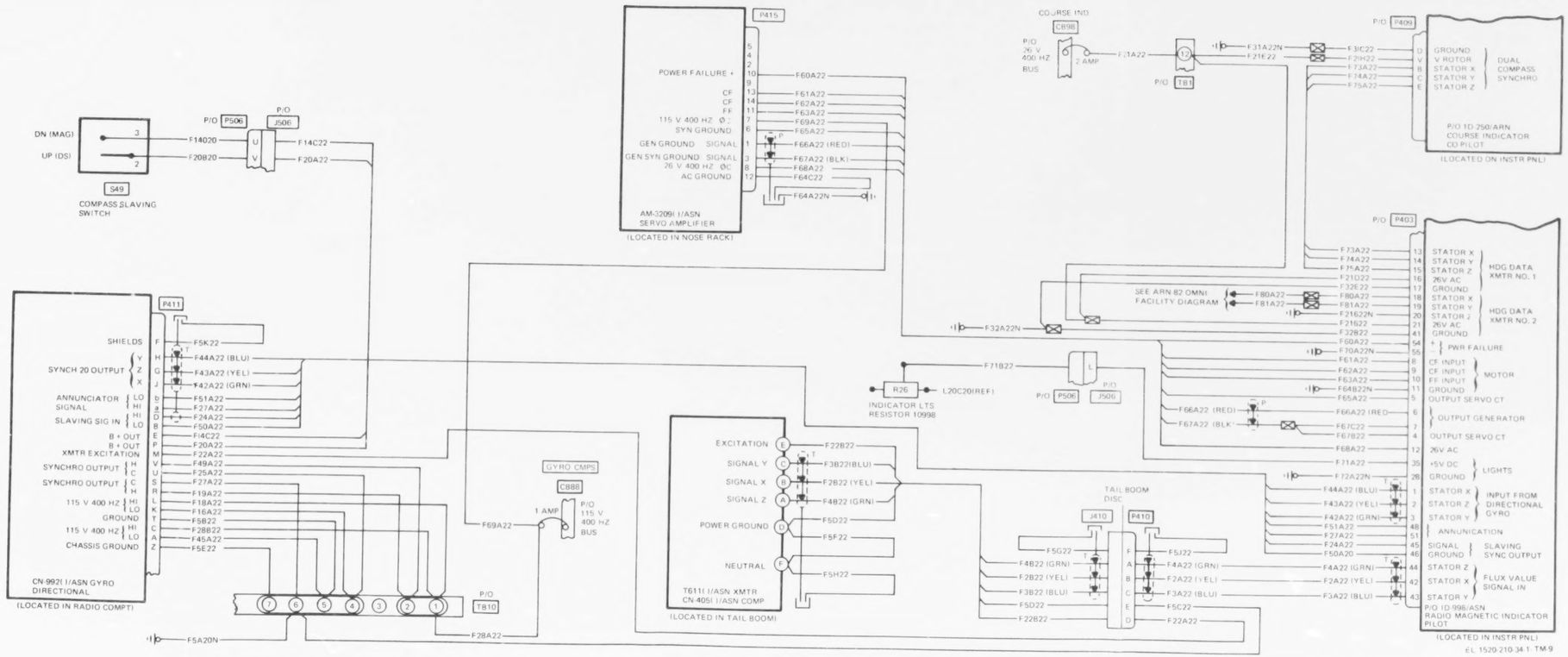
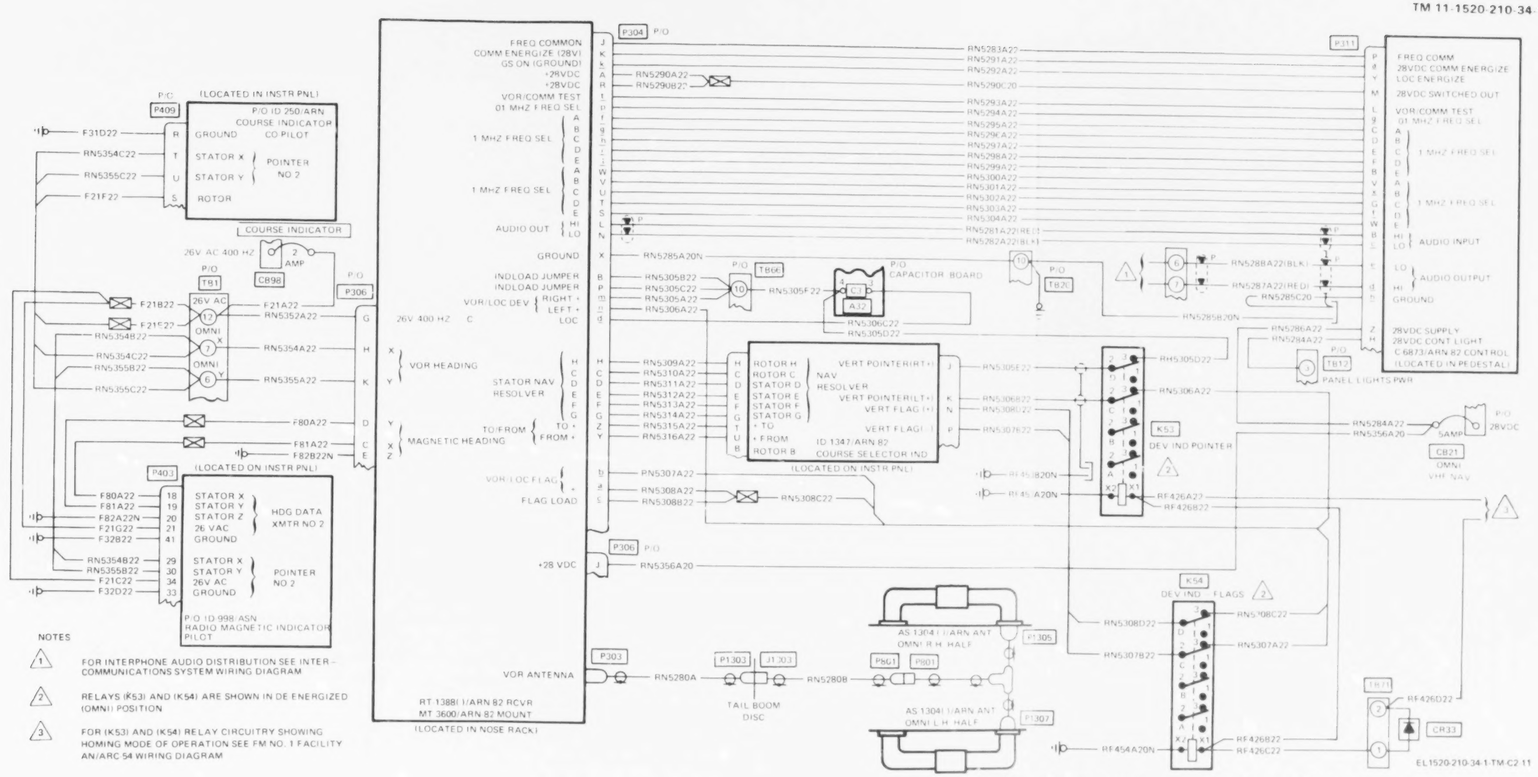


Figure FO-10. Gyro Magnetic Compass Facility AN/ASN-43 Wiring Diagram.

EL 1520-210-34-1-TM-9



NOTES

1. FOR INTERPHONE AUDIO DISTRIBUTION SEE INTER-COMMUNICATIONS SYSTEM WIRING DIAGRAM
2. RELAYS (K53) AND (K54) ARE SHOWN IN DE ENERGIZED (OMNI) POSITION
3. FOR (K53) AND (K54) RELAY CIRCUITRY SHOWING HOMING MODE OF OPERATION SEE FM NO. 1 FACILITY AN/ARC 54 WIRING DIAGRAM

Figure FO-11. VHF Omni Range (VOR) Facility AN/ARN-82 Wiring Diagram

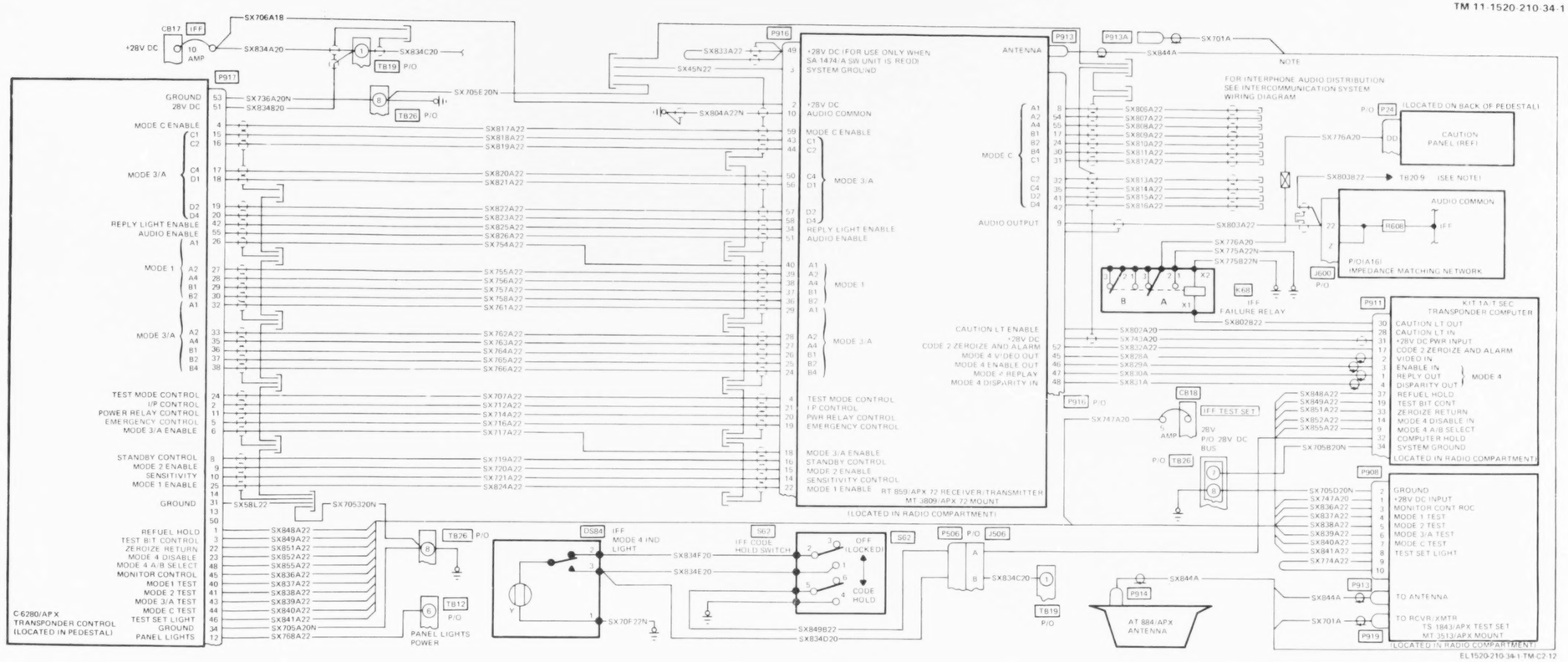


Figure FO-12. IFF Facility APX-72 Wiring Diagrams.

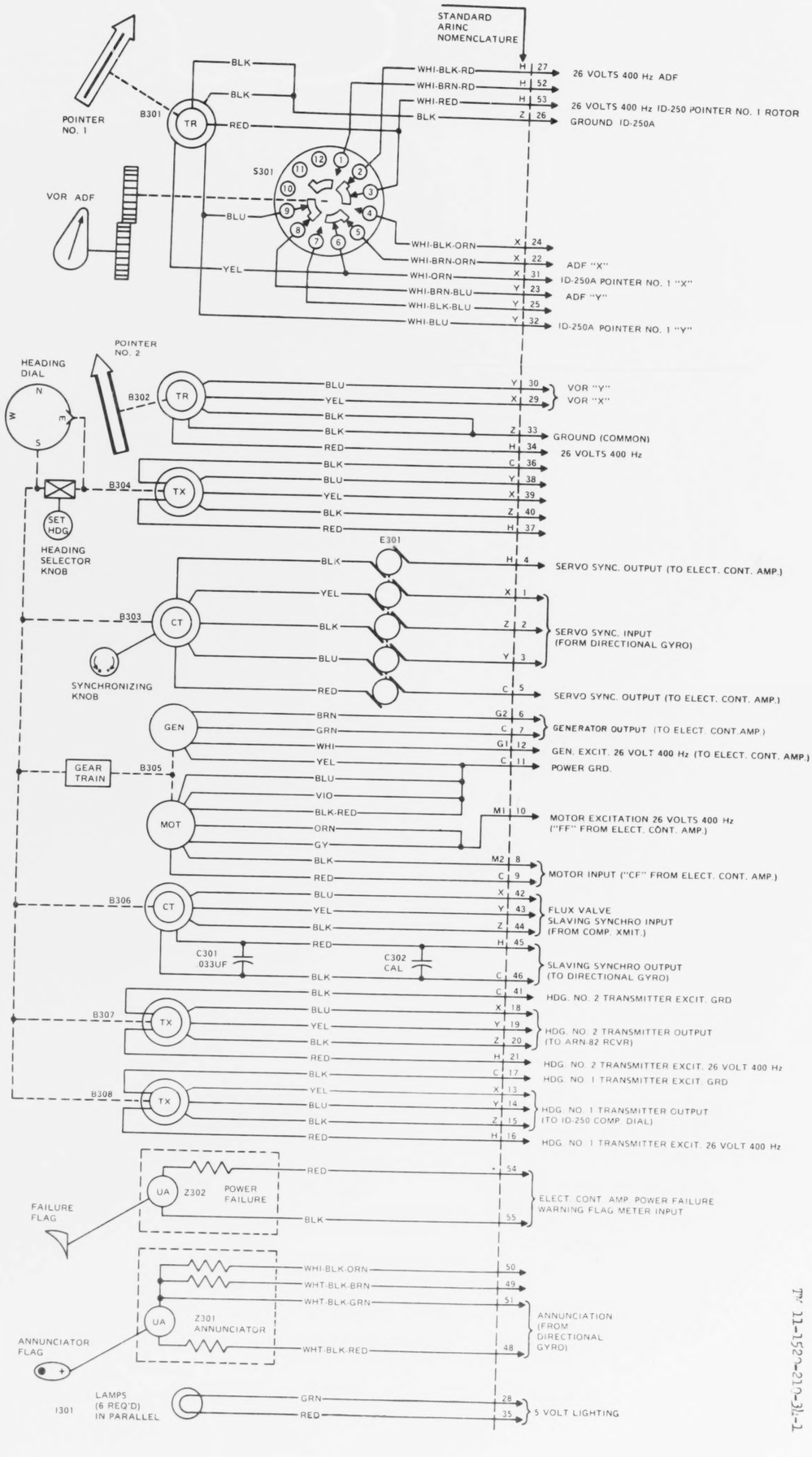


Figure FO-13. Radio Magnetic Indicator ID-998/ASN Schematic Diagram.

TM 11-1520-210-34-1

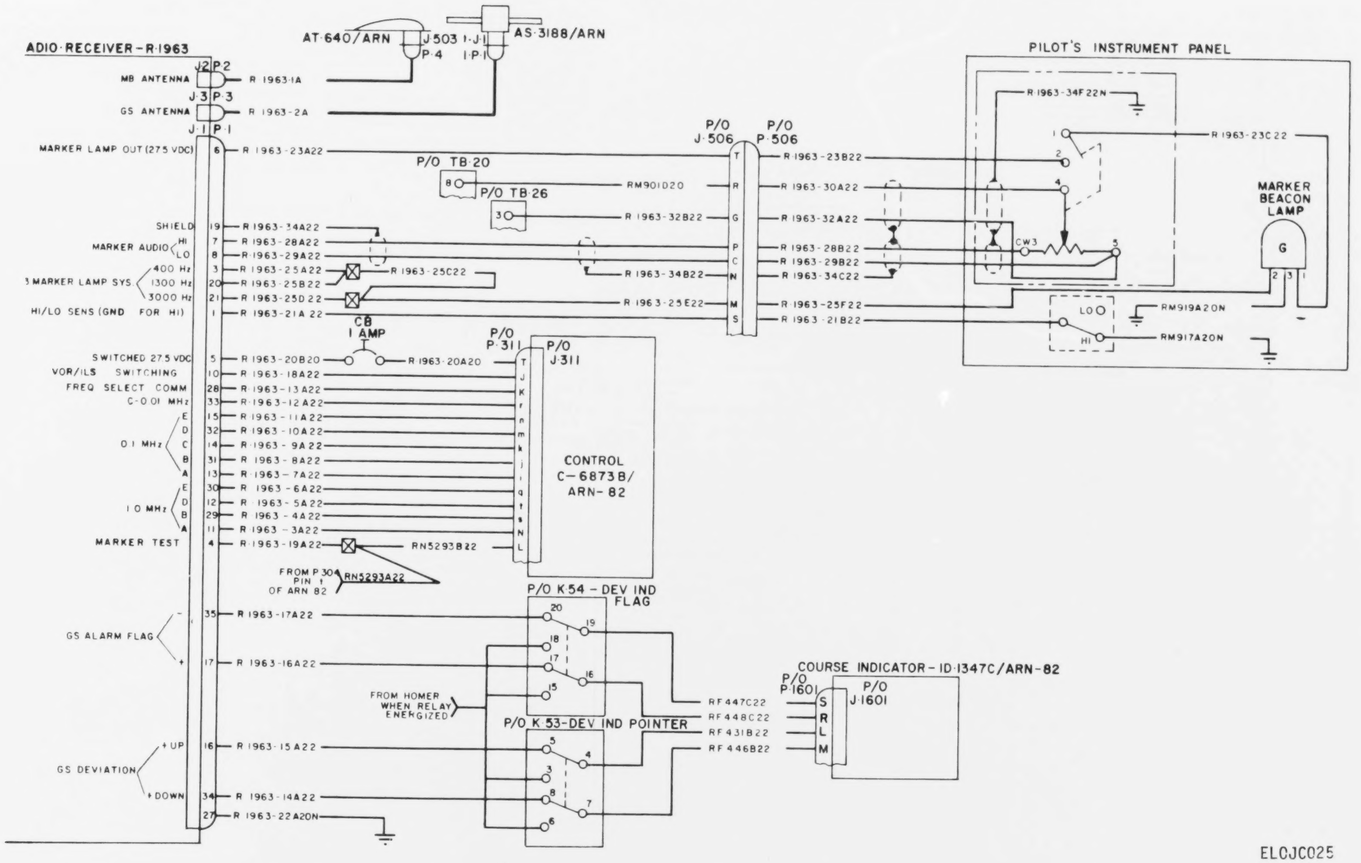


Figure F0-14. Glideslope/Marker Beacon Facility R-1963/ARN Wiring Diagram

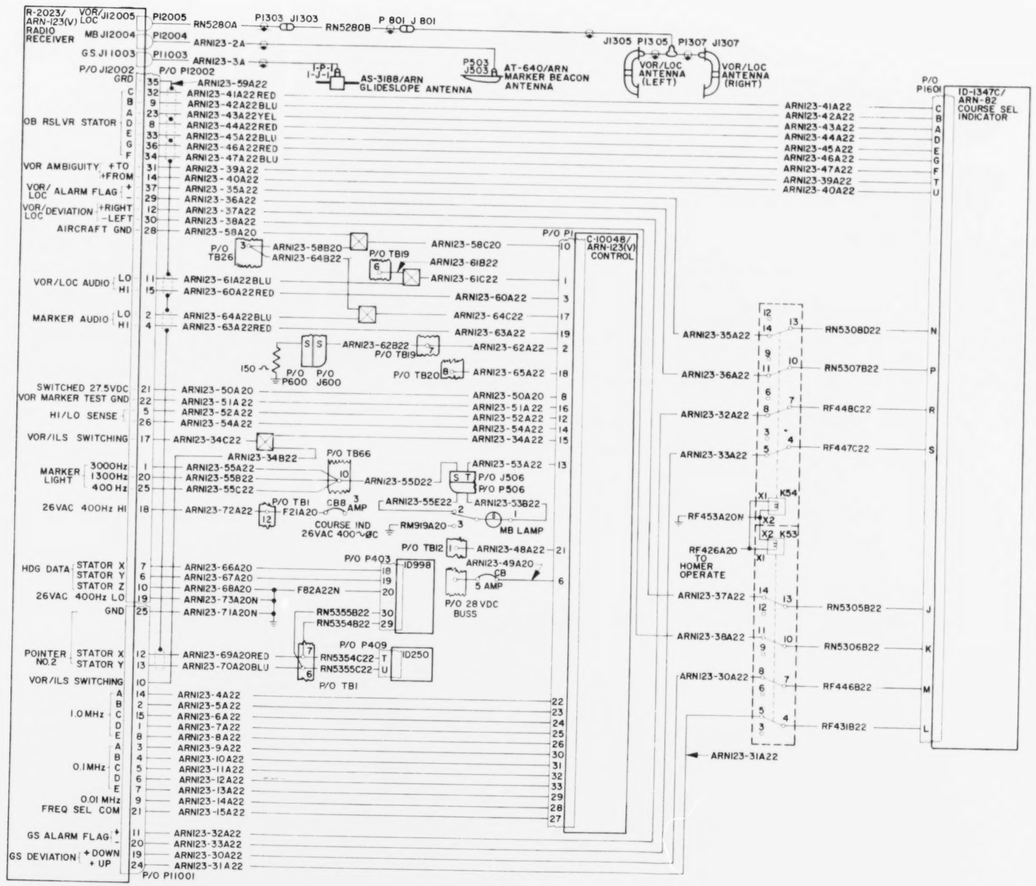
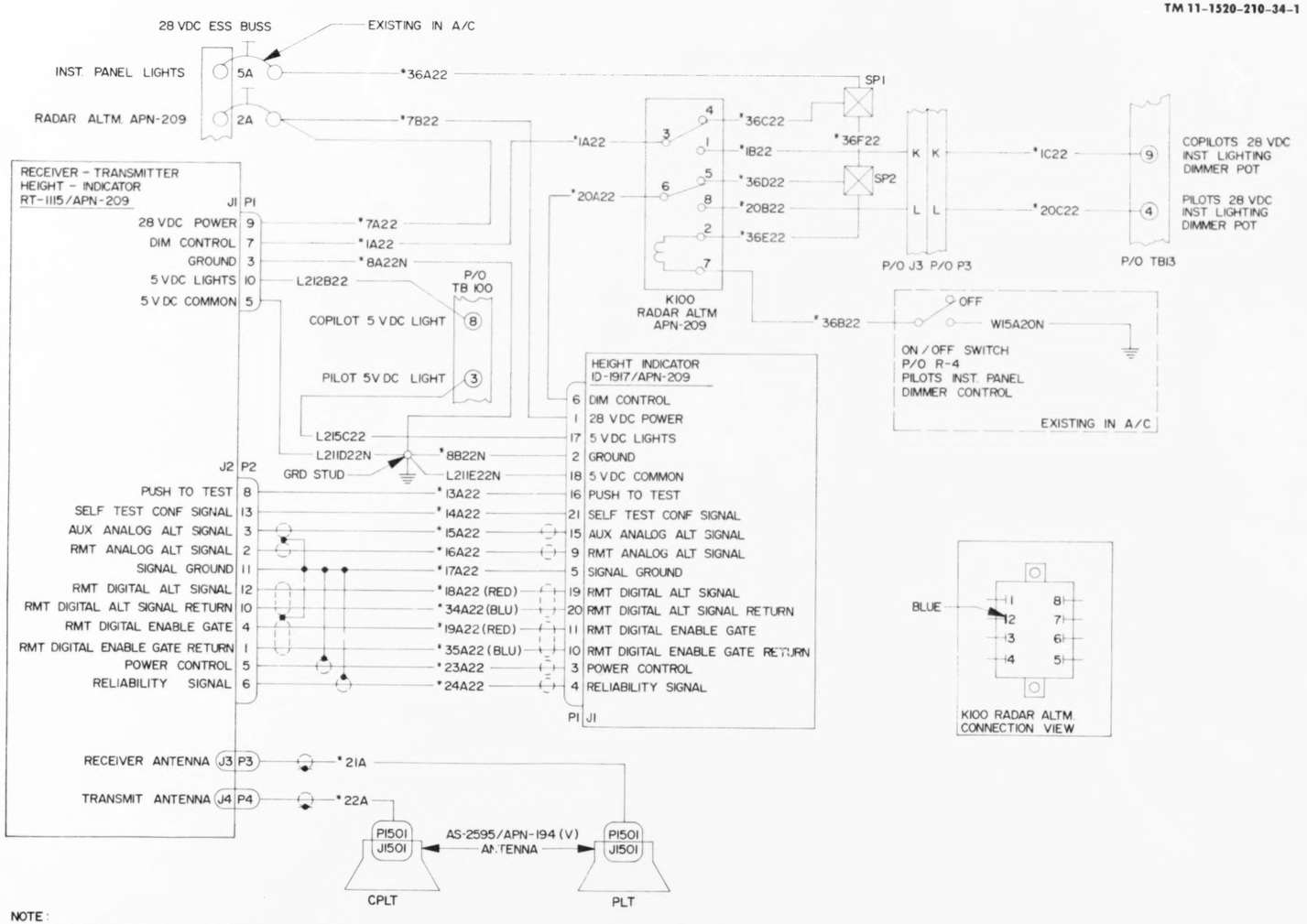


Figure FO-15. VOR/ILS Facility AN/ARN-123(V) Wiring Diagram



NOTE:

* PREFIX WITH "APN209-"

Figure FO-16. Radar Altimeter Facility AN/APN-209 Wiring Diagram